CONSERVATION & PROTECTION

Proceedings

1991
Environmental Issues Workshop
for
Federal Government Departments
and
Crown Corporations Operating in Ontario

March 25 to 27, 1991

Ottawa, Ontario

1991 ENVIRONMENTAL ISSUES WORKSHOP

AN INFORMATION WORKSHOP FOR FEDERAL DEPARTMENTS, AGENCIES
AND CROWN CORPORATIONS

MARCH 25 TO 27, 1991
OTTAWA, ONTARIO

ORGANZIED BY
OTTAWA DISTRICT OFFICE
ENVIRONMENTAL PROTECTION
CONSERVATION AND PROTECTION ONTARIO REGION
ENVIRONMENT CANADA

Acknowledgements

This workshop was organized by the undersigned with the assistance of Ms. Sharon Dunlop, Environmental Officer, Environmental Protection and Mr. Doug Hickey of Transport Canada, Aircraft Services Directorate. We would like to express our very great appreciation in particular to Sharon for her enormous effort since work began at the beginning of January.

Half of the cost of putting on the workshop was covered by Environment Canada, while the remainder was collected through registration fees. Monies were earmarked for information dissemination under the Federal House In Order and Environmental Emergencies areas in anticipation of the Green Plan which was released late last year. The Federal Programs Branch at Environmental Canada headquarters also assisted in the funding of this workshop.

Our thanks also go out to our Manager, Mr. Dale Cameron for his support in this venture, as well as to Ms. April Taylor of Taylor & Associates for her work on the workshop logistics and registration.

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1991 ENVIRONMENTAL ISSUES SEMINAR FOR FEDERAL GOVERNMENT DEPARTMENTS AND CROWN CORPORATIONS OPERATING IN ONTARIO

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1991 ENVIRONMENTAL ISSUES WORKSHOP FOR FEDERAL GOVERNMENT DEPARTMENTS AND CROWN CORPORATIONS OPERATING IN ONTARIO

FINAL SCHEDULE

MARCH 25 1991

0730 - 0830	**REGISTRATION in Front Hall and COFFEE in Ballrooms B and C**
SESSION ONE	**OVERVIEWS OF THE GREEN PLAN, CEPA (PART IV), AND FEDERAL PROGRAMS**
0830 - 0835	**Introduction by Moderator** - Simon Llewellyn, Regional Director, Environmental Protection, Ontario Region, Environment Canada
0835 - 0910	**The Green Plan and The Federal Code of Environmental Stewardship** - Ann MacKenzie, Director, Office of Environmental Stewardship, Environment Canada
0910 - 0935	**Overview of CEPA Part IV Regulations and Other Regulations Applicable to Federal Facilities** - Dale Cameron, Manager, Ottawa District Office, Environmental Protection, Ontario Region, Environment Canada
0935 - 1000	**Implications of CEPA Regulations to the Average Government Employee** - Beverly Hobby, Legal Advisor, Legal Services, Environment Canada
1000 - 1020	**BREAK in Exhibit Hall (Ballrooms B and C)**
1020 - 1045	**Federal Non-Hazardous Waste Incineration Regulations** - Dave Hay, Chief, Office of Waste Management Division, Conservation and Protection, Environment Canada
1045 - 1115	**FIBEC and the Federal Boiler Emission Regulations** - Geoff Ross, Program Engineer, Oil, Gas and Energy Division, Conservation and Protection, Environment Canada
1115 - 1135	**Presentation on Federal Programs covered by the Ottawa and Toronto Offices of Conservation and Protection, Ontario Region** - Dale Cameron, Manager, Ottawa District Office, Environmental Protection, Ontario Region, Environment Canada

1135 - 1200 **Overview of Additional Federal Requirements Applicable to Federal Facilities in Ontario** - Lawrence King, Senior Environmental Officer, Ottawa District Office, Environmental Protection, Ontario Region, Environment Canada

1200 - 1330 **LUNCHEON in "Top of the Hill" and "Stop 26" and VISIT DISPLAY BOOTHS in Ballrooms B and C**

SESSION TWO PCB's: STORAGE, DESTRUCTION AND TRANSPORTATION REQUIREMENTS

1330 - 1335 **Introduction by moderator** - Dale Cameron, Manager, Ottawa District Office, Environmental Protection, Ontario Region, Environment Canada

1335 - 1400 **Storage of PCB Wastes Interim Order** - Marcel de Bellefeuille, Environmental Officer, Ottawa District Office, Environmental Protection, Ontario Region, Environment Canada

1400 - 1425 **Regulations Regarding PCB Destruction** - John Hilborn, Research Manager, PCB Technology Division, Conservation and Protection, Environment Canada

1425 - 1450 **Physical/Chemical and Incineration Techniques for PCB Destruction** - Dave Campbell, Head, Control Section, Hazardous Waste Management Division, Conservation and Protection, Environment Canada

1450 - 1510 **BREAK in Exhibit Hall, Ballroom B & C**

1510 - 1535 **Sunset for PCBs: The Planned Phasedown of PCBs in use** - Lawrence Fedoruk, Controls Development Engineer, Controls Development Section, Commercial Chemicals Branch, Environment Canada

1535 - 1600 **Retrofilling and Reclassification of Transformers** - Arman Garakanian, Project Supervisor, ENSR Operations Ltd.

1600 - 1620 **Federal Requirements for International and Inter-Provincial Transport** - Stewart Teasell, Contaminants Officer, Environmental Protection, Ontario Region, Environment Canada

1620 - 1640 **Provincial Requirements for Transportation by Roadway** - Wayne Herrick, Environmental Officer, Kington Regional Office, Ontario Ministry of the Environment

1640 - 1800 **RECEPTION IN EXHIBIT HALL (Cash Bar, Ballrooms B and C)**

MARCH 26 1991

0800 - 0830 **REGISTRATION in Front Hall and COFFEE in Ballrooms B and C**

SESSION THREE ENVIRONMENTAL EMERGENCIES AND CONTAMINATED SITES

0830 - 0835 **Introduction by moderator** - Doug Hickey, Manager, Dangerous Goods Program, Aircraft Services Directorate, Transport Canada

0835 - 0900 **Environmental Emergency Procedures in Ontario: Legislated and Non-Legislated** - J. P. Auclair, Regional Environmental Emergency Co-ordinator, Environmental Emergency Division, Toronto Office, Environmental Protection, Ontario Region

0900 - 0925 **Contingency Plan Development** - Cliff Holland, Director of Training, Spill Management Inc.

0925 - 0950 **Case Study: The Implementation of a Contingency Plan** - Cliff Holland, Director of Training, Spill Management Inc.

0950 - 1010 **BREAK in Ballrooms B and C**

1010 - 1030 **Environmental Emergency Training Methods** - Cliff Holland, Director of Training, Spill Management Inc.

1030 - 1130 **Spill Response and Spill Response Equipment** - Merv Fingas, Chief, Emergencies Services Division, River Road, Environmental Technology Centre, Environment Canada

1130 - 1200 **National Contaminated Sites Remediation Program** - Doug Tilden, Senior Advisor, Federal Activities Division, Federal Programs Branch, Environment Canada

1200 - 1330	**LUNCHEON at "Top of the Hill" and "Stop 26" and Visit Exhibition Hall (Ballrooms B & C)**
SESSION FOUR	**UNDERGROUND STORAGE TANKS**
1330 - 1335	**Introduction by moderator** - Asit Hazra, Chief, Federal Activities Division, Federal Programs Branch, Environment Canada
1335 - 1415	**The Environmental Code of Practice for Underground Storage Tanks** - Kelly Karr, Program Engineer, Oil, Gas and Energy Division, Conservation and Protection, Environment Canada
1415 - 1440	**The Federal Facilities Underground Storage Tank Manual** - Frank D'Addario, Environmental Officer, Ottawa District Office, Environmental Protection, Ontario Region, Environment Canada
1440 - 1505	**Leaking Underground Storage Tanks: Site Remediation** - Jim Snider, Consultant, Jacques, Whitford Ltd.
1505 - 1525	**BREAK in Ballrooms B and C**
1525 - 1550	**Site Remediation Case Study: Leaking Underground Storage Tanks at Agriculture Canada Animal Disease Research Institute.** - Carlos Da Silva, Consultant, John D. Patterson and Associates Ltd.
1550 - 1615	**Non-Invasive Environmental Monitoring: Electro-Magnetic (E.M). Surveys** - Andy Rybak, Vice President, Areco Canada Inc.
1615 - 1640	**Leak Detection for Underground Storage Tanks** - Dan Senia, Warrick Controls, Consultant for Davis Controls Ltd.
1640 - 1730	**VISIT EXHIBITS (Ballrooms B and C)**
MARCH 27, 1991	
0800 - 0830	**REGISTRATION in Front Hall and COFFEE in Ballrooms B and C**
SESSION FIVE	**ENVIRONMENTAL AUDITING**
0830 - 0835	**Introduction by moderator** - Lawrence King, Senior Environmental Officer, Ottawa District Office, Environmental Protection, Ontario Region, Environment Canada

0835 - 0915 **Overview of Environmental Auditing** - Marie-Claude Savoie, Consultant, Arthur D. Little of Canada Ltd.

0915 - 0935 **Case Study #1: Environmental Audit of the River Road Environmental Technology Centre** - Dave Thornton, Director, RRETC, Environment Canada

0935 - 1000 **Case Study #2: Environmental/ Occupational Health and Safety Audit of the Transport Canada Aircraft Services Directorate Facility at Ottawa International Airport** - Doug Hickey, Manager, Dangerous Goods Program, Aircraft Services Directorate, Transport Canada

1000 - 1020 **BREAK in Ballrooms B and C**

SESSION SIX GOING GREEN IN THE FEDERAL WORKPLACE

1020 - 1025 **Introduction by moderator** - Lawrence King, Senior Environmental Officer, Ottawa District Office, Environmental Protection, Ontario Region, Environment Canada

1025 - 1050 **Environment Canada's "Go Green at Work" Program** - Ann MacKenzie, Director, Office of Environmental Stewardship, Environment Canada

1050 - 1115 **The National Environmental Choice Program** - Graham Hardman, Director, Environmental Choices Program, Environment Canada

1115 - 1140 **The Papersave Program: Current Status and Future Directions Outside NCR** - Gilles Landry, Manager, Special Projects, Crown Assets Distribution Group, Supply and Services Canada

1140 - 1205 **The Parliament Hill Environmental Audit and Action Plan** - Angela Ebsworth, Environmental Co-ordinator, House of Commons

1205 - 1230 **Reduce, Reuse, Recycle: Waste Reduction Opportunities at Federal Facilities** - Bill Armstrong, President, Energy Pathways Inc.

1230 - 1240 **Closing Remarks** - George Cornwall, Director, Federal Programs Branch, Environment Canada

1240 - 1400 **Buffet Lunch in Exhibit Hall (Ballrooms B and C)**

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SESSION ONE

OVERVIEWS OF THE GREEN PLAN, CEPA (PART IV), AND FEDERAL PROGRAMS

Moderator: Simon Llewellyn, Regional Director, Ontario Region
Environment Canada

THE GREEN PLAN AND THE FEDERAL CODE OF ENVIRONMENTAL STEWARDSHIP

Ann MacKenzie, Director, Office of Environmental Stewardship
Environment Canada

M. Ann MacKenzie

The Green Plan and the Code of Environmental Stewardship

I am pleased to have this opportunity to speak with you today about Canada's Green Plan for a healthy environment and how it relates to federal government land and facilities.

There are a few aspects of the Plan which are worth reviewing because they impact on our approach to federal facilities.

First, the Plan is comprehensive. It offers new policies, programs and standards for our land, water and air; our North; our parks and wildlife; our waste generation; our handling of toxic chemicals; and many other areas of concern. The Green Plan deals with large-scale international issues such as climate change and acid rain. It also promotes small-scale, local actions such as community tree planting and consumer information programs.

Second, the Plan is based on public consultation.

Between April and June of 1990, there were 41 information sessions across Canada, attended by more than 6,000 Canadians and consultation workshops were held in 17 cities.

A wrap-up session in August condensed this input into a list of over 500 recommendations. The great majority have been integrated into the Plan.

During those consultations Canadians told us that they expected the federal government to be providing leadership and practicing what it preaches.

The government has been listening to Candians in forming the Green Plan and will continue listening in the future when it comes to implementing the Green Plan initiatives.

It must listen because of the very nature of the targets and schedules contained in the Green Plan.

In each policy area, the Plan sets forth clear national goals. On some, we may be able to move faster than expected; with others we may have to be more cautious. We must be ready to response to changing circumstances. We must be prepared to fine-tune our targets so that they are achievable.

These consultations will be public and open, providing an opportunity for all Canadians to be involved. And the targets and schedules will offer a yardstick by which all of us can measure the success of the Green Plan. The government is committing itself to live up to these targets and schedules or to be held accountable for any changes to them. In fact, the Minister of the Environment will report annually on Green Plan progress.

Another outstanding feature of our Green Plan is that it charts a long-term strategy.

We are not proposing a one - or two - year quick fix. The problems have developed for decades or longer; unfortunately, instant solutions will not work. Instead we have put forward what we call a "plan for life." The specific initiatives in the Green Plan are to be undertaken within the coming six years. But when six years are over, our Green Plan still continues. At the end of year one, we will examine and discuss with all concerned Canadians what we should be doing in year seven. After year two, we will plan and discuss actions for year eight, and so on.

This "rolling" plan will help ensure a consistent, progressive and fully open approach to environmental planning.

Finally, this is a Plan for everyone. We all have a part to play in making it a reality but Canada's Green Plan is not aimed simply at government or business -- although it spells out clear roles and obligations for both. The Plan also provides for the participation of communities, provinces, non-government organizations, universities, native groups, youth groups and anyone else who wants to get involved.

Now let's relate these aspects of the Green Plan to how we approach "greening" our federal facilities.

Comprehensive - we must look at all environmental aspects and not just concentrate on a couple.

Public Consultation and Involvement - we must never forget that we are doing this because it is what the Canadian public expects and they will be watching how well we do it. We are not doing it to satisfy the "system" or Environment Canada.

Targets and schedules - the whole approach of the Green Plan has been to establish targets against which progress will be judged. This same design has been incorporated for federal facilities. Long term strategy - while some of our targets can be implemented quickly there is a recognition that what we are doing is changing our way of doing business, our way of making decisions over the long-term. The "rolling" plan approach will certainly be used in respect of our own operations.

Chapter VII Starting in Our Own House

While these general principles of the Green Plan apply to how we develop our activities there is one particular chapter which specifically addresses the federal government - Chapter VI - starting in our Own House. There are three parts to this chapter.

a) environmental assessments of all proposed projects for which a federal department has decision-making authority

b) comprehensive review of the environmental implications of existing statues, policies, programs and regulations

c) Federal operations and activities will become exemplary primarily through the adoption of the Code of Environmental Stewardship.

It is this latter part which is the major concerns of federal facility managers. Environmental assessments will, of course, be important for major new projects.

Environmental Stewardship

To begin it is useful to remind ourselves why we are undertaking this initiative other than just the general thought of it being "a good thing to do". Departments are too strapped for resources to allow for that kind of luxury.

There are two main reasons that we must get our house in order. The first is that the federal government is the largest single "business" in Canada and as such can have a significant impact on the environment. The second is that the activities and practices of the government must be exemplary and we must meet and frequently exceed all regulations and standards we recommend for others.

The stewardship initiative has five components: the Code, the targets, departmental action plans, environmental audits and the Office of Environmental Stewardship.

The Code of Environmental Stewardship

The Code of Environmental Stewardship is a statement of our general commitment to achieving sustainable development and more specific commitments in such areas as incorporating environmental concerns into decision making, purchases, material inputs and land transactions.

Given the general nature of the Code it would be difficult to state precisely if an organization is meeeting the code but easier to say if they were operating within the "spirit" of the Code.

Targets

The targets, on the other hand, are designed, like the targets in the Green Plan, to be precise actions with schedules. The government is accountable to the public to meet these schedules.

The targets reflect the commitments which the government has made and/or areas of high environmental priority. They have evolved after extensive consultations with affected departments under Treasury Board consultation mechanisms. It should be noted that these targets are initial targets and are expected to be modified and added to over time - they are not static. This is similar to the "rolling" plan concept of the Green Plan itself.

Departmental Action Plans

Since the targets must be generic, applying to the government as a whole, they cannot reflect the specific circumstances and opportunities of each department. For this reason departments are being required to develop environmental action plans. These are, in essence, workplans stating how the department will implement the Code and targets. Not all departments will be impacted by each target and some departments may be able to implement a target more or less or do so faster or slower than stated in the government-wide target. In many cases the first item in the workplan will be to figure out the scope of the work and the resources required. The action plan should also identify any unique opportunities for environmental improvements specific to that department's operations. These action plans must be made published in whatever manner the department chooses and annual status report on accomplishments must also be published.

Environmental Audits

Environmental audits are often viewed as both a starting point and an integral component of environmental action plans. The Green Plan states that "Beginning in 1992, in cooperation with the Office of the Comptroller General, federal departments and agencies will implement policies and procedures for environmental auditing". This does not mean that the OCG will be directing the audits or that even your own internal audit groups will lead. It does mean that proper auditing techniques will be followed and that to ensure this the protocols should be followed and the internal auditors should be part of the planning team. Departments which do not operate facilities might decide to do waste audits or a review of their purchasing practices.

Office of Environmental Stewardship

To manage this initiative an Office of Environmental Stewardship is being established in Environment Canada. Its role is to act as a focal point for co-ordination, assist the adoption of the Code and targets, provide information and guidance, and serve as a link between operating managers and scientific experts. In that sense it is a clearinghouse and facilitator. It will also work closely with central agencies and common service agencies to ensure that policies, services and practices which are "institutionalized" are designed to make good environmental decisions the easy decisions.

The Office will also be responsible for strategic planning aspects such as monitoring implementation and considering changes and additions to the targets. When a problem is identified with a target then the Office will try to overcome the problem whether it is one of information, training, government rules resourcing priorities etc. - in other words a troubleshooter.

It is equally important to understand what the Office of Environmental Stewardship does not do. It is not the green police seeing if departments are doing what they are supposed to be doing. It's interest in departments/activities is to hail their successes and help with their difficulties. Keep your dirty linen but lets make sure your clean linen waves from the tallest flagpole so the Canadian public can see our great accomplishments.

Another role that the Office does not play is one of providing technical expertise - at least not directly. There are lots of technical experts in Environment Canada and elsewhere. As a facilitator the Office will refer departments to the correct people and where appropriate stay involved to be certain that the problem is solved and any generic lessons learned are shared with others. For this reason the Office is usually a member of interdepartmental committees relating to the targets such as the PCB destruction committee and the Advisory Committee on Water Usage.

While some of the targets are CEPA regulations the Office does not wear a regulatory hat. Rather it helps encourage compliance, as it does with all the other targets. The regulatory and enforcement function is the responsibility of the Environmental Protection Directorate. More information on this may be obtained from the Federal Programs Branch.

Reporting/Monitoring/Accountability

As stated earlier the Office of Environmental Stewardship is responsible for managing and monitoring this initiative. It must also be prepared to report at least annually on the government's progress in meeting the targets. This does not mean that departments either report to or are accountable to Environment Canada. Accountability clearly rests up the line with the Minister. This concept is particularly important in these days of IMAA agreements and PS 2000. It is up to each Minister to implement the policies of the government. It will really be the Canadian public who tell us if we are doing enough and doing it fast enough. Environment Canada's role will be to specify such things as what information has to be reported and where necessary how progress should be measured. Environment Canada will produce aggregate reports for the federal government but each Minister will be answerable for the progress or lack of progress within each department.

The Green Plan clearly stated that the environment is everyone's responsibility. That is no less so when we are talking about federal government operations. It becomes the responsibility of each and every employee.

OVERVIEW OF CEPA PART IV REGULATIONS AND OTHER REGULATIONS APPLICABLE TO FEDERAL FACILITIES

Dale Cameron, Manager, Ottawa District Office
Environmental Protection, Ontario Region, Environment Canada

OVERVIEW OF CEPA PART IV REGULATIONS
&
OTHER CEPA REGULATIONS APPLICABLE TO FEDERAL FACILITIES

INTRODUCTION:

The Canadian Environmental Protection Act (Bill C-74) came into being on June 28th, 1988. It had a relatively long and difficult birth. The Parliamentary Committee studying the Draft legislation conducted an intensive review of it, taking such an interest in its development that a record number of amendments were made to it at Committee stage.

One of the areas of the Act that came under scrutiny by the Committee, and which underwent significant amendments was Part IV, the main focus of this paper.

PART IV BACKGROUND:

Part IV is specifically designed for Federal Departments, Agencies, Crown Corporations, Federal works, undertakings and lands. In the original version of the Act, submitted to the Committee for review, Part IV assigned to Environment Canada a responsibility to develop Guidelines and Codes of Good Practice for use by these Federal organizations. This was similar to a role previously held by Environment Canada.

However, on February 10, 1987 something had occurred which would had a profound influence on the Parliamentary Committee deliberations and on the ultimate shape of Part IV.

On that day, the Ontario Ministry of the Environment laid charges against an Ottawa-area liquid waste haulage and disposal company (Go-Hut) and a number of its clients. Caught in the web, along with a number of private sector waste generators, were several Federal agencies and several Federal employees - specifically the National Research Council, the Bank of Canada, and employees of Transport Canada and Supply and Services Canada.

After some deliberation, the Bank of Canada decided to plead guilty, and was fined $8,000. We will never know what might have been the final form of Part IV if the remaining agency (National Research Council) and the employees had pleaded guilty but it was decided instead that they would enter a defence of "crown immunity", on the basis that in this case Provincial legislation does not apply to Federal agencies or Federal employees.

The decision brought down on September 21, 1987 by His Honour Judge B.W. Lennox at Ottawa was in favour of the defendants - that is he ruled that in this case the Provincial legislation did not apply to Federal Departments, Agencies or their employees.

This decision then became an issue in subsequent Parliamentary Committee discussions. The Committee decided that it was unacceptable that Departments, Agencies and Crown Corporations, and their employees would not be subject to the same sorts of environmental requirements that are applied by Provincial governments to all other Canadians. They called for much tighter controls than what had been in the original draft of the legislation.

The result is the present Part IV, which now provides Environment Canada's Minister with never-before-held authority to develop a Federal Environmental Protection Regime similar to that being applied by Provinces to the non-Federal sector.

PART IV DETAILS:

A brief summary of the features of Part IV is in order. The complete text of Part IV is attached to this paper.

Section 52 defines the area of application, explaining the meaning of "Federal lands", and "Federal works or undertakings".

Section 53 provides Environment Canada's Minister with the authority to establish, with the approval of the Governor-in-Council,"guidelines for use by departments, boards, and agencies of the Government of Canada and, where appropriate, by corporations named in Schedule C to the Financial Adminstration Act and Federal regulatory bodies in the exercise of their powers and the carrying out of their duties and functions".

Section 54 contains the Regulation-making authorities, and is separated into 2 sections - Sec.54.1 and Sec.54.2.

Section 54.1 was designed to enable other Ministers to approach Environment Canada to help them regulate specific activities or operations on their property for which they don't have environmental regulatory authority. It addresses the broad area of "protection of the environment" and applies to Federal works and undertakings or Federal lands but requires the concurrence of the Minister having primary administartive responsibility to that area.

Section 54.2 was designed to enable Environment Canada's

Minister to make regulations setting "limits on the release of emissions, and effluents" and prescribing "waste handling and disposal practices" all for departments, boards and agencies of the Government of Canada and where appropriate by corporations named in Schedule C to the Financial Administration Act.

The remaining Sections 55 to 60 are primarily administrative measures. Section 58 does require special note however. It is sometimes referred to as the "whistleblower provision" and provides protection against disciplinary action, dismissal or harassment for any person (including Federal employees) who report a release in contravention of any regulation made under this Part. It further provides that the persons identity may be kept secret, if requested by that person, as well as any information that could reasonably reveal the identity of the person.

PART IV REGULATIONS:

Existing Part IV Regulations:
To date only one Regulation has been passed, that being the "Federal Mobile PCB Treatment and Destruction Regulations", which came into force on January 3, 1990.

Part IV Regulations under development:
A number of initiatives are under way, at various stages of completion, to introduce additional Part IV Regulations, under Section 54.2 - i.e. emissions, effluents and waste management practices. Subsequent papers at this workshop will address existing and soon-to-be introduced Regulations in detail. The following summary information is taken from the January 1991 "Quarterly Report on Regulatory Initiatives in Conservation & Protection" prepared by Environment Canada Headquarters:

- Hazardous Waste Management at Federal Facilities; tentative dates for Gazette I - spring 1992; Gazette II - summer 1992. These Regulations will specify requirements concerning the on-site management of hazardous wastes and for the management of hazardous wastes moved off-site to centralized facilities by federal institutions.

- Landfill Operations & Management at Federal Facilities; Gazette I - October 1992; Gazette II - December 1992. The Regulation will deal with the landfilling of waste and includes all types of waste other than toxic wastes.

- Wastewater Regulations; Gazette I - November 1992; Gazette II - March 1993. This Regulation will control wastewater discharges from federal facilities including discharges to municipal collection systems, discharges from federally-owned and operated wastewater treatment facilities and stormwater discharges.

- Contingency Planning at Federal facilities; Gazette I and II - 1993. The Regulation will demonstrate the federal government's leadership in ensuring proper spill preparedness at federal facilities by providing standards for the development of spill contingency plans.

- Non-Hazardous Solid Waste Incinerators at Federal Facilities - Gazette I - Autumn 1991; Gazette II - Spring 1992. These Regulations will set limits on the emission of pollutants and monitoring requirements of non-hazardous solid waste disposed of at federal facilities.

- Air Emissions Regulations for Boilers at Federal Facilities; Gazette I and II - spring/summer 1991. Emission limits will apply to new and existing boilers at Federal facilities.

OTHER CEPA REGULATIONS:

Not only are their Regulations written under Part IV that apply specifically to Federal Departments, Agencies and Crown Corporations, but Section 4 of the Act states "This Act is binding on Her Majesty in right of Canada or a province". This means that not only should Federal agencies and their employees be aware of the Part IV Regulations, but they should also be knowledgeable about existing and proposed Regulations under other Parts of the Act. Some of the Regulations that may have some application to Federal operations and activities, or may indirectly affect those operations/activities are:

- Chlorobiphenyl Regulations (PCBs). They prohibit the manufacture, sale, or import of PCBs for certain uses, specify maximum concentrations in products and specify maximum quantities and concentrations that may be released to the environment.

- PCB Waste Storage Interim Order (proposed to be made into a Regulation in September 1991).

- Ozone-depleting Substances Regulations No.3 Amendments (Halon Fire Extinguishers). Draft amendments to Regulations No.3 repropose the ban on halon fire extinguishers. Gazette I - September 1991; Gazette II - December 1992.

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- Diesel Quality Regulations. Primarily reduces the sulphur content of fuel. Gazette I - November 1991; Gazette II - March 1992.

- New Substances Notification - Phase III - Biotechnology Products Amendment. These regulations will be amended to include information requirements associated with the manufacture or importation of biotechnology products. Gazette I - January 1992; Gazette II - April 1992.

- Spill Reporting Regulations. These Regulations will ensure appropriate reporting to Environment Canada of all toxic substance spills under CEPA and spills of deleterious substances under the Fisheries Act. No dates for Gazette I or II available.

- Export of PCB Waste. Export of PCB waste is banned except for PCB waste to the United States and in small capacitors with less than 500g of PCB as part of a product. In force as of August 15, 1990.

IMPLICATIONS OF CEPA REGULATIONS TO THE AVERAGE GOVERNMENT EMPLOYEE

Beverly Hobby, Legal Advisor, Legal Services, Environment Canada

(See Hand-out)

OUR RESPONSIBILITIES
UNDER CEPA

I) Introduction

- What is CEPA?
- Does CEPA apply to my work?

II) The Consequences of violating CEPA or the Regulations passed under CEPA

- Who is responsible for obeying CEPA?
- What are the consequences of violating CEPA?
    - Can I be prosecuted?
    - Who else can be prosecuted?
    - What happens if I am prosecuted?

III) WHAT CAN BE DONE TO PREVENT VIOLATIONS OF CEPA?

- "an ounce of prevention is worth a ton of cure".
- practical suggestions to promote knowledge of and compliance with CEPA.
- Development of an in-house warning system.

FEDERAL NON-HAZARDOUS WASTE INCINERATION REGULATIONS

Dave Hay, Chief, Office of Waste Management Division
Conservation and Protection, Environment Canada

(Draft Copy of Federal Non-Hazardous Solid Waste Incinerator Regulations)

REGULATIONS RESPECTING STATIONARY INCINERATOR FACILITIES FOR THE DISPOSAL OF NON-HAZARDOUS SOLID WASTE THAT ARE OPERATED BY OR UNDER CONTRACT WITH FEDERAL INSTITUTIONS

Short Title

1. These Regulations may be cited as the Federal non-hazardous Solid Waste Incinerator Regulations.

INTERPRETATION

2. In these Regulations,

"Act" means the Canadian Environmental Protection Act; (Loi)

"existing installation" means a non-hazardous solid waste incinerator which was in operation or under construction prior to the coming into force of these Regulations; (installation existante)

"federal institution" means a department, board or agency of the Government of Canada or any corporation that is named in Schedule III to the Financial Administration Act; (institution fédérale)

"initial startup" means the date when waste material is first burned in a new installation; (mise en marche initial)

"modified installation" means a non-hazardous solid waste incinerator that has been physically modified or its method of operation changed in ways that may increase the amount of any air pollutant emitted to the atmosphere; (installation modifiée)

"new installation" means a new non-hazardous solid waste incinerator constructed or modified after the coming into force of these Regulations; (nouvelle installation)

"non-hazardous solid waste incinerator" means any device used in the process of burning non-hazardous solid waste; (incinérateur de déchets solides non-dangereux)

"non-hazardous solid waste" means any product, substance or organism, that is no longer used for its original purpose and that is not dangerous goods as defined in the Transportation of Dangerous Goods Act; (déchets solides non-dangereux)

"normal cubic metre" means the volume of a gas at 25°C and 101.3 kPa; (mètre cube normal) "operator" means the owner or the person having the charge, management or control of the non-hazardous solid waste incinerator, whether on his own account or as the agent of any person; (opérateur).

"2,3,7,8-substituted PCDDs" means any polychlorinated dibenzo-p-dioxins that have the molecular formula $C_{12}H_{8-n}Cl_nO_2$, in which "n" is from 4 to 8 and chlorine atoms are located at the 2,3,7,8 positions on the molecule; (PCDD chlorés aux positions 2, 3, 7 et 8)

"2,3,7,8-substituted PCDFs" means any polychlorinated dibenzofurans that have the molecular formula $C_{12}H_{8-n}Cl_nO$, in which "n" is from 4 to 8 and chlorine atoms are located at the 2,3,7,8 positions on the molecule; (PCDF chlorés aux positions 2, 3, 7, et 8)

Application

3. (1) These Regulations apply in respect of a non-hazardous solid waste incinerator that are owned or operated by or under contract with a federal institution;

(a) on federal lands, or

(b) any where in Canada by or under contract with a federal institution.

(2) Effective with their coming into force, these Regulations apply in respect of any new installation or modified installation.

(3) Effective January 1, 1994, these Regulations apply in respect of any existing installation having a capacity of one tonne per day or more, or three cubic meters charging capacity or more.

(4) Subject to subsection (5), effective January 1, 1996, these Regulations apply in respect of any non-hazardous solid waste incinerator, except paragraph 5 (1) (b) to (d) do not apply to an incinerator having a capacity less than one tonne per day or three cubic meters charging capacity.

(5) These Regulations do not apply to a non-hazardous solid waste incinerator having a capacity of less than one tonne per day or three cubic meters charging capacity, where the incinerator is operated in a sparsely populated area and no other acceptable disposal method is available.

(6) Notwithstanding subsection (1) to (5), these Regulations do not apply to a non-hazardous solid waste incinerator during its operation for research purposes or as part of a training program.

Duty of Federal Institutions

4. Where a non-hazardous solid waste incinerator is operated by or under contract with a federal institution, the federal institution shall ensure that the person who operates the incinerator complies with sections 5 to 12.

5. (1) No person shall operate a non-hazardous solid waste incinerator that releases into the environment a gas that contains a concentration of

(a) particulate matter that exceeds 20 milligrams per normal cubic metre;

(b) hydrogen chloride that exceeds 75 milligrams per normal cubic metre; or

(c) 2,3,7,8-substituted PCDDs and 2,3,7,8-substituted PCDFs that exceeds 0.5 nanograms per normal cubic metre, when determined in accordance with section 7.

(d) carbon monoxide in excess of 57 milligrams per normal cubic meter, 4 hour rolling average.

(2) For the purposes of subsection (1), the concentrations are corrected to 11% oxygen, on a dry basis.

6. No person shall operate a non-hazardous solid waste incinerator that releases liquids without the prior written approval of the Minister.

7. The concentration referred to in paragraphs 5 (1) (c) are determined by multiplying the concentration of each congener of 2,3,7,8-substituted PCDDs and 2,3,7,8-substituted PCDFs that is set out in an item of column I of the schedule I by the corresponding toxicity factor set out in column II of that item, and by adding the products thereof.

Information on Design and Performance

8. No person shall operate a non-hazardous solid waste incinerator, unless the person provides the Minister with information on the design and performance of the incinerator,

that demonstrates that the incinerator is capable of meeting standards set out in Sections 5 and 6 and is authorized by the Minister in writing to operate the incinerator.

Testing

9. For the purpose of Sections 5, the person who operates a non-hazardous solid waste incinerator shall provide proof, satisfactory to the Minister, that the incinerator can meet the criteria as specified in these regulations, by conducting stack testing shall be conducted within six months of:

(a) initial start up for a modified installation.

(b) commencement of full normal operation for new installation.

10. (1) Any person who operates a non-hazardous solid waste incinerator shall, at the request of the Minister, conduct tests during its operation to determine if the incinerator meets the standards out in section 5.

(2) Any person who operates a non-hazardous solid waste incinerator shall submit to the Minister in writing the results of any test conducted pursuant to section 9 and subsection 10 (1) no later than sixty days after the day on which the test was completed.

Test Methods

11. Every person who conducts a test pursuant to section 9 and 10 shall employ the methods referred to in section 12.

12. (1) For the purpose of paragraph 5 (a), the concentration of particulate matter in the gases shall be measured in accordance with the methods set out in the Standard Reference Methods for Source Testing: Measurement of Emission of Particulates from Stationary Sources, Department of the Environment, Report EPS 1-AP-74-1, February 1974, as amended from time to time.

(2) For the purpose of paragraph 5 (b), the concentration of hydrogen chloride in the gases shall be measured in accordance with the methods set out in the Reference Methods for Source Testing: Measurement of Emission of Gaseous Hydrogen Chloride from Stationary Sources, Department of the Environment, Report EPS 1/RM/1, June 1989, as amended from time to time.

(3) For the purpose of paragraph 5 (c), 2,3,7,8-substituted PCDDs and 2,3,7,8-substituted PCDFs in the gases shall be measured in accordance with the sampling method set out in the Reference Methods for Source Testing: Measurement of Selected Semi-Volatile Organic Compounds from Stationary Sources, Department of the Environment, Report EPS 1/RM/2, June 1989, as amended from time to time.

(4) For the purpose of paragraph 5 (d), the concentration of carbon monoxide in the gases shall be measured in accordance with the methods set out in the Reference Methods for Source Testing: Measurement of Emission of Carbon Monoxide from Stationary Sources, Report EPS 1/RM/4, published by the department of the Environment in July, 1990, as amended from time to time.

SCHEDULE I
(Section 7)

TOXICITY EQUIVALENCY FACTORS
(TEFs)
FOR SPECIFIC PCDD AND PCDF CONGENERS

When only homologue test data is available apply the largest equivalency factor.

Homologue	Positions Chlorinated	Equivalency Factor
T_4CDD	2,3,7,8	1
P^5CDD	1,2,3,7,8	0.5
H_6CDD	1,2,3,4,7,8	0.1
	1,2,3,6,7,8	0.1
	1,2,3,7,8,9	0.1
H_7CDD	1,2,3,4,6,7,8	0.01
O_8CDD	1,2,3,4,6,7,8,9	0.001
T_4CDF	2,3,7,8	0.1
P_5CDF	1,2,3,7,8	0.05
	2,3,4,7,8	0.5
H_6CDF	1,2,3,4,7,8	0.1
	1,2,3,7,8,9	0.1
	1,2,3,6,7,8	0.1
	2,3,4,6,7,8	0.1
H_7CDF	1,2,3,4,6,7,8	0.01
	1,2,3,4,7,8,9	0.01
O_8CDF	1,2,3,4,6,7,8,9	0.001

FIBEC AND THE FEDERAL BOILER EMISSION REGULATIONS

Geoff Ross, Program Engineer, Oil, Gas and Energy Division,
Conservation and Protection, Environment Canada

(Draft Copy of Federal Boiler Emission
Regulations is also attatched)

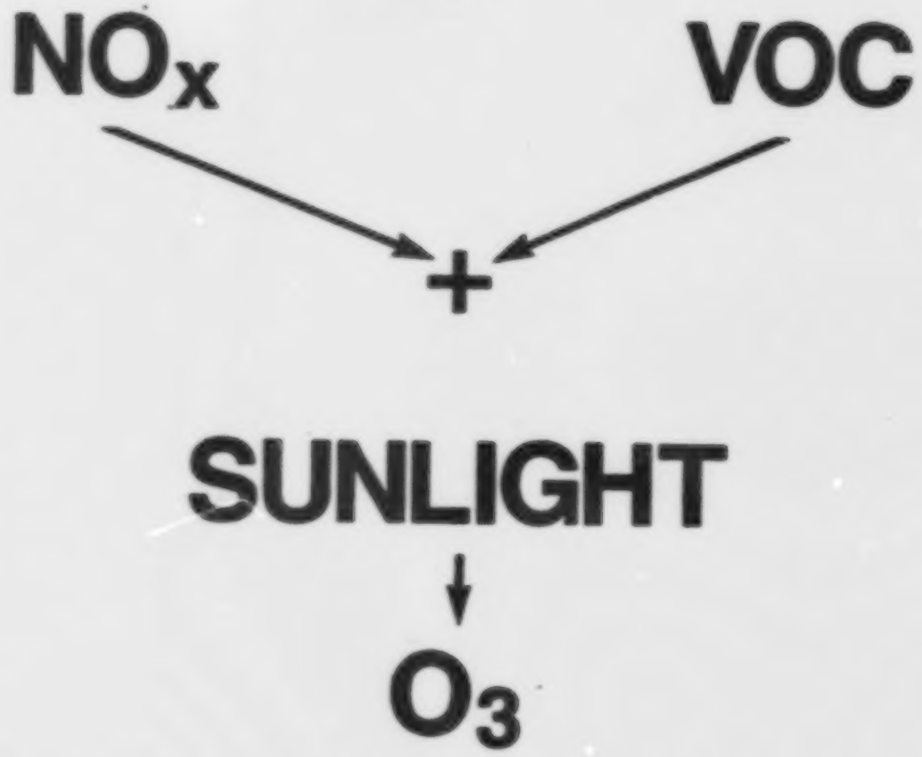
FEDERAL BOILER EMISSION REGULATIONS

Geoff Ross
Environment Canada

OVERVIEW

- RATIONALE / ENVIRONMENTAL ISSUES
- INVENTORY OF BOILERS AT FEDERAL FACILITIES
- REGULATION
- CALCULATION OF ANNUAL EMISSIONS
- REFERENCE METHOD
- STATUS
- INFORMATION AVAILABLE

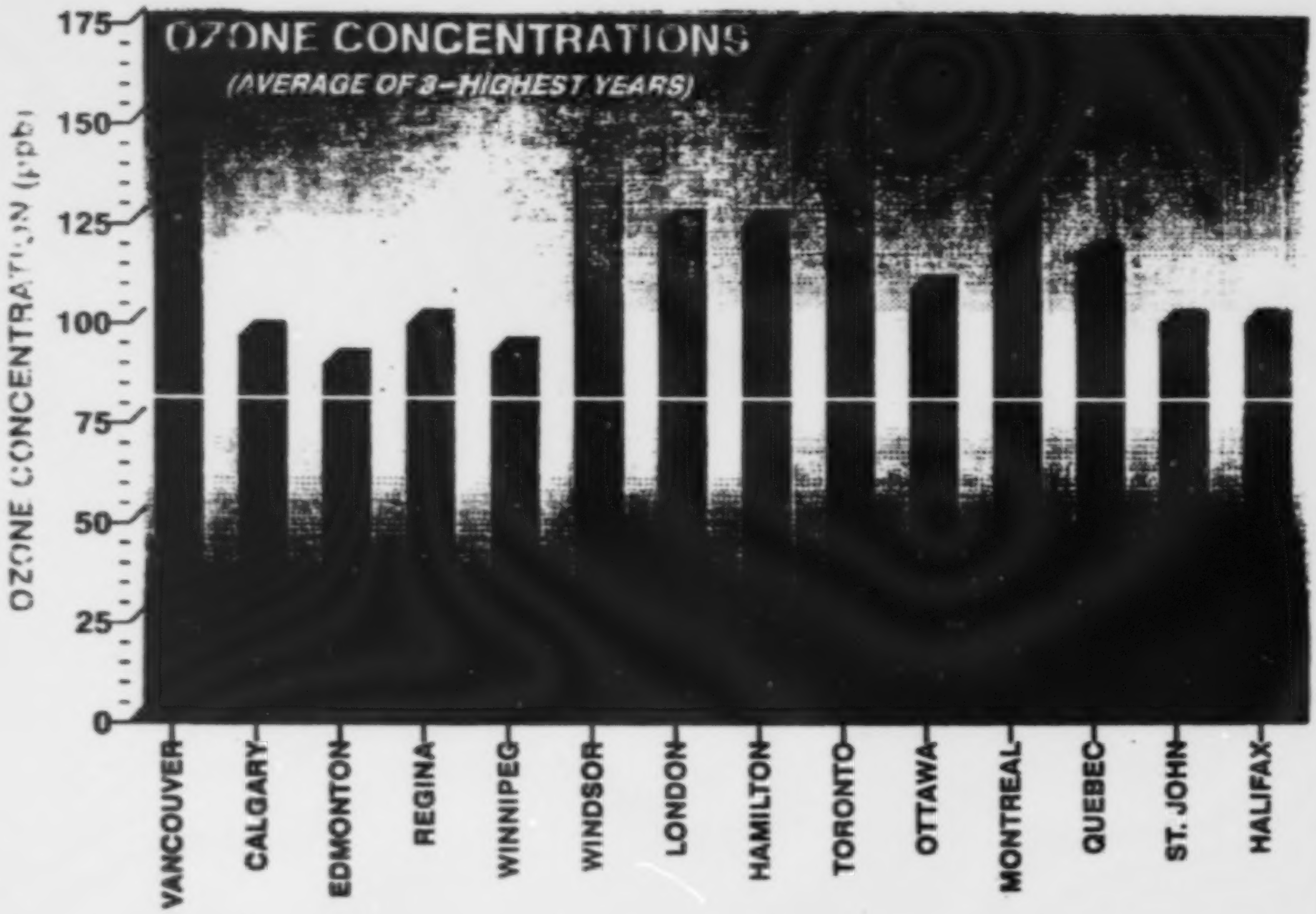
OZONE



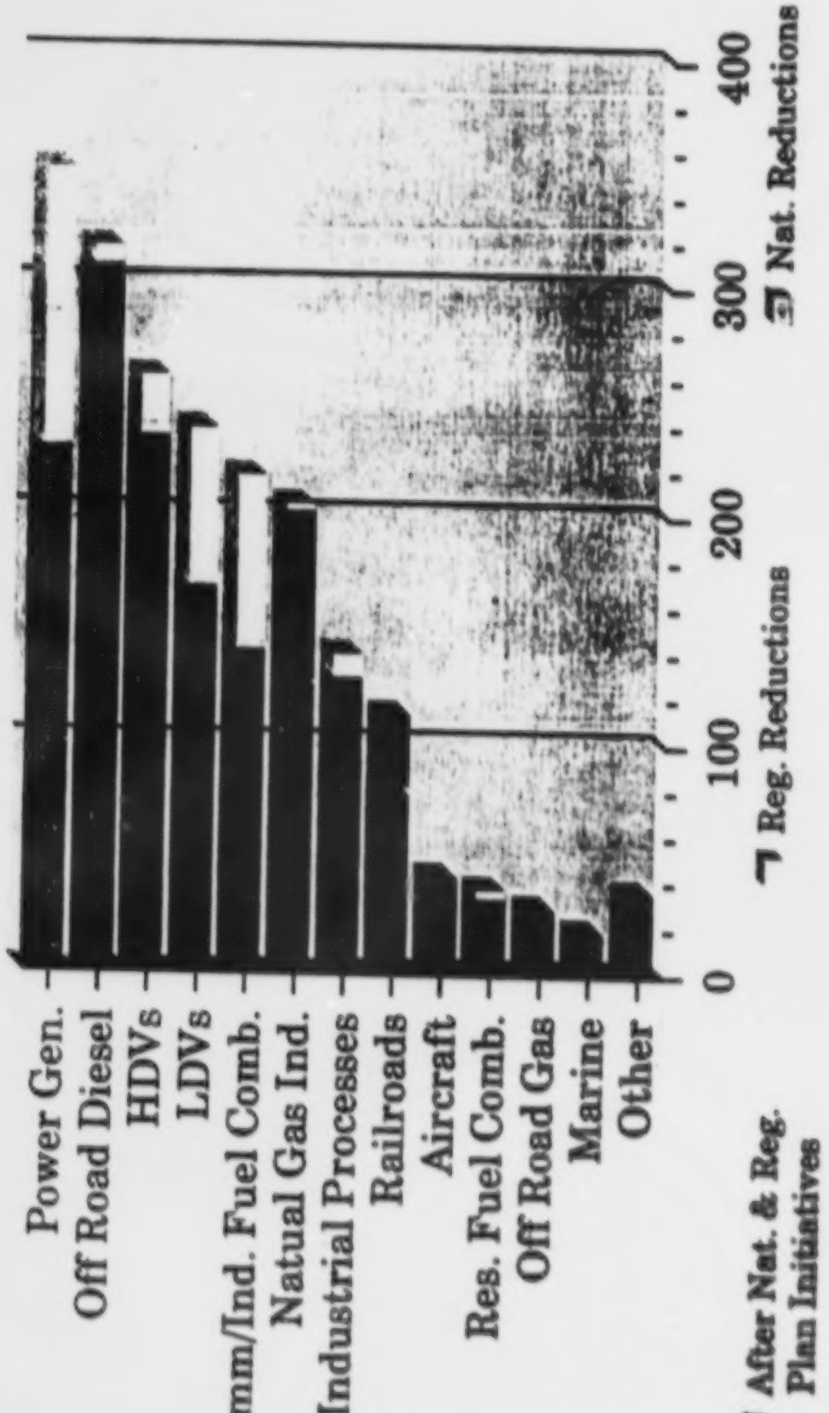
NO_x + VOC

SUNLIGHT

O_3


OZONE CONCENTRATIONS
(AVERAGE OF 3-HIGHEST YEARS)
OZONE CONCENTRATION (ppb)
175
150
125
100
75
50
25
0
VANCOUVER
CALGARY
EDMONTON
REGINA
WINNIPEG
WINDSOR
LONDON
HAMILTON
TORONTO
OTTAWA
MONTREAL
QUEBEC
ST. JOHN
HALIFAX

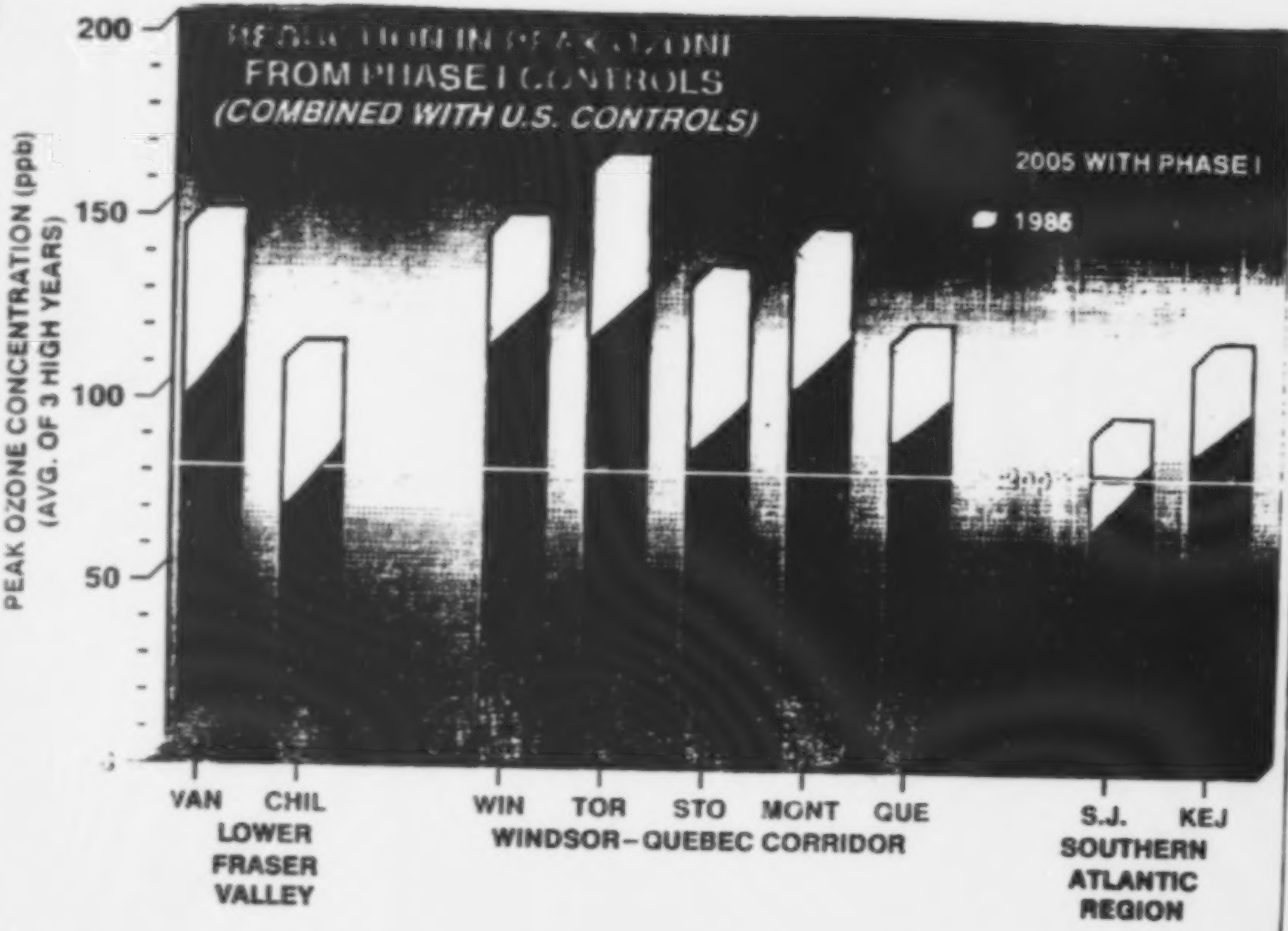
Pre-Plan & Post-Plan NO_x Emissions (Kt/Yr) National-2005



PHASE I
NOx / VOC PLAN

National Source Control Initiative		Effective Date
Fed. Reg.	Light Duty Vehicle NOx Limit	94/96
Fed. Reg.	Heavy Duty Vehicle NOx Limit	92
Fed. Reg.	Const. Diesel NOx Limit	98
Rep. Sched.	Cap on Rail Transport NOx	92
CEPA G/L	NSPS - Power Plants	95/2000
CCME G/L	NSPS - Industrial Boilers	94
CCME G/L	NSPS - Gas Turbines	94
CCME G/L	NSPS - Compressor Engines	93

Regional Source Control Initiative		Effective Date
Prov.	Motor Vehicle I & M	94
Prov.	Retrofit Existing Power Plants	95/97
Prov.	Retrofit Existing Ind. Boilers	97
Prov.	New & Existing Steel Mills	95/97
CCME G/L	Retrofit Existing Refineries	97


REDUCTION IN PEAK OZONE
FROM PHASE I CONTROLS
(COMBINED WITH U.S. CONTROLS)
2005 WITH PHASE I
1986
PEAK OZONE CONCENTRATION (ppb)
(AVG. OF 3 HIGH YEARS)
200
150
100
50
0
VAN
CHIL
LOWER FRASER VALLEY
WIN
TOR
STO
MONT
QUE
WINDSOR–QUEBEC CORRIDOR
S.J.
KEJ
SOUTHERN ATLANTIC REGION

FIBEC REGULATION
RATIONALE

- No existing federal NOx emission standards for industrial boilers
- Contributes to putting "federal house in order"
- Federal leadership in industrial boiler emission standards
- Develop Canadian expertise and support services for low NOx technology
- Contribute to meeting UN ECE NOx Control Protocol
  - application of BATEA

FEDERAL DEPARTMENTS/AGENCIES INVITED TO FIBEC TASK FORCE *

ENVIRONMENT CANADA, HQ & REGIONS
(chair of Task Force)

ENERGY, MINES AND RESOURCES (CANMET)
NATIONAL DEFENCE
PUBLIC WORKS
TRANSPORT
CORRECTIONAL SERVICES
AGRICULTURE
FISHERIES AND OCEANS
INDIAN AND NORTHERN AFFAIRS
COMMUNICATIONS
ROYAL CANADIAN MOUNTED POLICE
NATIONAL RESEARCH COUNCIL
CANADA POST CORPORATION
CANADA PORTS CORPORATION
ATOMIC ENERGY OF CANADA LTD.

* as of April, 1990

FEDERAL BOILERS
BY DEPARTMENT / AGENCY

Department/Agency	No. of Boilers•
National Defence	117
Public Works	26
Correctional Services	25
Transport	18
Atomic Energy	10
National Research Council	4
Mounted Police	1
Canada Post	2
Communications	2
Total	205

• capacity › 5.9 MJ/s

FIBEC REGULATION EMISSION STANDARDS

APPLICATION:

Boiler	Capacity	Effective Date
New	> 1.5 MJ/s	April 1, 1991
Existing	> 5.9 MJ/s	April 1, 1997 (NOx) April 1, 1994 (other parameters)

STANDARDS:

		maximum allowable emission rate			equiv. fuel
Parameter	Fuel	ng/J	ppm	mg/cu.m	sulphur (%)
NOx	gas	22	40		
	#2 oil	43	80		
	#6 oil	110	200		
	coal	150	250		
SO2	#2 oil	25	32		0.05
	#6 oil	500	650		1.0
	coal	500	610		
PM	coal	43		160	
CO	all fuels	125	400		

Smoke Density: Smoke No. < 4 for #1 and #2 oil
Smoke No. < 6 for #4, #5 and #6 oil

EMISSION TESTING: Minimum once per year

NOx EMISSION REDUCTION AT EXISTING FACILITIES

- an alternative to meeting NOx emission standards for individual boilers

fiscal year	NOx emission reduction (%) from base year gas, #1, #2 oil-fired facilities	 coal, #4, #5, #6 oil-fired facilities
95/96	25	15
97/98	50	30

- Base year NOx emissions (tonnes) specified in regulation for all facilities with at least one boiler >5.9 MJ/s (20 MBTU/hr) heat input capacity
- Federal departments can request that the Minister revise base year NOx emissions specified in the regulation (must supply supporting information)

TOTAL EMISSION REDUCTION OPTION FOR FACILITIES

ADVANTAGES:

- Greater flexibility in reducing NOx
- May avoid retrofits to "problem" boilers
- Lower cost per tonne of NOx removed
- Incentive for energy efficiency

POSSIBLE DISADVANTAGES:

- May constrain facility expansion
- May in some cases require greater NOx reductions than individual boiler standards

FIBEC REGULATION
DECISION POINTS

JUNE 1, 1994 Which NOx Control Option ?

1. Individual Boiler NOx Standards
   - by April 1, 1997
2. Total Facility NOx Reduction
   - notify Minister
   - first stage reduction target April 1, 1995 - Mar. 31, 1996

APRIL 1, 1995 Is Base Year NOx Emission (Schedule I) Acceptable ?

1. YES - use as basis for NOx reduction
2. NO - develop base year NOx emission data in support of request to Minister to revise Base Year NOx emission (Schedule I)
   - notify Minister

SCHEDULE III

(One copy to be completed for each boiler within 60 days of an emission test, and submitted to the appropriate regional office of Environment Canada.

General

1. Owner:
   (Federal Department, Board or Agency responsible for boiler)

2. Name of Facility:

3. Address:

4. Contact Person:
   Title:
   Phone No: Fax No:

Boiler Data

5. Boiler No.

6. Date contract to purchase signed:

7. Heat input capacity (MJ/s):

8. Main fuel: Alternate fuel:

Emission Data

8. Date of last emission test:

9. Name of firm conducting test:

11. Rate of discharge of air contaminants when firing main fuel (attach test report):

NOx (ng/J)	SO2 (ng/J)	Particulates (mg/m^3)	CO (ng/J)	Smoke Density

12. Rate of discharge of air contaminents when firing alternate fuel (attach report):

NOx (ng/J)	SO2 (ng/J)	Particulates (mg/m^3)	CO (ng/J)	Smoke Density

Approved By:
Title:
Date:

Received By:
Title:
Date:

SCHEDULE V

1. Owner:
(Federal Department, Board or Agency responsible for boiler)

2. Name of Facility:

3. Address:

4. Year: April 1, ______ to March 31, ______

NOx Emissions for Main Fuel (Specify fuel type ______)

5. Boiler No. 1 2 3 4 5 6
(include all boilers
at facility)
----

6. Rate of Discharge
of NOx (ng/J):
(attach test report)

7. Heat Input for
Main Fuel (terajoules)
April 1 to March 31:
(terajoules = joules / 10^{12})

8. NOx Emission (tonnes):
(Line 6 x Line 7 / 1000)

NOx Emissions for Alternate Fuel (Specify fuel type ______)

9. Boiler No. 1 2 3 4 5 6
(Include all boilers
at facility)
----

10. Rate of Discharge
of NOx (ng/J):
(attach test report)

11. Heat Input for
Alternate Fuel (terajoules)
April 1 to March 31:
(terajoules = joules / 10^{12})

12. NOx Emission (tonnes):
(Line 10 x Line 11 / 1000)

---

13. Total Emissions of
Nitrogen Oxides (tonnes):
(Summation of NOx
Emission, Line 8 and
12 for all boilers)

REFERENCE METHOD FOR EMISSIONS TESTING

In comparison to other Reference Methods developed by Environment Canada for regulatory purposes, the FIBEC Reference Method is:

- Simplified, less costly
- A compromise with respect to standards of accuracy

BUT:

"Application of this Reference Method for compliance testing requires strict adherence to the method in all respects. Deviation from the method may invalidate the test results"

Table 1 Analyzer Specifications

Parameter	Target Species			
	NO	SO_2	CO	O_2
Range	0 - 1000 (ppm)	0 - 2000* (ppm)	0 - 1000 (ppm)	0 - 20.9 (%)
Accuracy	← 5% →			2%
Continuous Sampling Period	Able to monitor flue gas concentrations continuously for a minimum of one hour			
Drifts	Maximum 5% over a one-hour period			
Ambient Operating Temperature	10 to 40° C or higher			
Interference	As per specifications in Appendix I			

* range: a higher range must be used if high sulpher coal/oil will be encountered

CRITICAL COMPONENTS OF REFERENCE METHOD

- STRATIFICATION CHECK
  - choose appropriate sampling port
- PRETEST
  - within 2 weeks of testing
  - includes: a) zero/span check
    b) reproducibility check
    c) interference check
- CALIBRATION
  a) prior to test
  b) after test
  - check for drift
  - requires zero/span gases on site
- TESTING
  - period of 30 minutes for each test

  NOTE:

  The regulation stipulates 2 tests
  - one at 30 - 40 % MRC
  - one at 60 - 70 % MRC

  emission rate is average from 2 tests
- CALCULATIONS
  - as specified in Reference Method

FIBEC REGULATION

STATUS AS OF MARCH 8, 1991

- Regulation being reviewed by Privy Council Office of Justice (PCOJ)
- RIAS being reviewed by Regulatory Affairs Branch (RAB)
- Prepublication in Canada Gazette, Part I expected late spring/summer 1991 (delays due to regulatory backlog, including GST legislation)
- 60-day comment period following prepublication in Canada Gazette I
- Final regulation published in Canada Gazette, Part II following 60-day comment period

INFORMATION AVAILABLE

- Federal Boiler Emission Regulations, Draft, Oct., 1990
- Regulatory Impact Analysis Statement (accompanies Federal Boiler Emission Regulations), Draft, Oct., 1990
- Reference Method for the Monitoring of Gaseous Emissions from Fossil-fuel Fired Boilers, Reference Method EPS 1/RM/15, Sept., 1990
- Federal Industrial Boiler Emission Control Program, Report prepared by Sypher:Mueller Int. and Ortech Int. for Environment Canada
  - Vol. I Summary
  - Vol. II AES Downsview Demonstration
  - Vol. III Emissions Monitoring at Federal Facilities
  - Vol. IV Cost-Effectiveness of Emission Control Regulations

REGULATIONS RESPECTING RELEASE INTO THE AMBIENT AIR OF EMISSIONS FROM BOILERS AT FEDERAL FACILITIES

DRAFT / ÉBAUCHE
OCTOBER/OCTOBRE
1990

Short Title

1. These Regulations may be cited as the *Federal Boiler Emission Regulations*.

Interpretation

2. In these Regulations,

"boiler" means a device that burns fossil fuel for the purpose of generating hot water or steam and is used primarily for the heating of buildings; (*chaudière*)

"new boiler" means a boiler for which a contract to purchase is signed on or after April 1, 1991; (*nouvelle chaudière*)

"existing boiler" means a boiler that was built or for which a contract to purchase was signed before April 1, 1991; (*chaudière existante*)

"federal institution" means a department, board or agency of the Government of Canada, or any corporation that is named in Schedule III to the *Financial Administration Act*; (*institution fédérale*)

"fossil fuel" means natural gas, petroleum, coal, and any form of gaseous, liquid or solid fuel derived from such for the purpose of creating useful heat; (*combustible fossile*)

"MJ/s" means megajoules per second; (*MJ/s*)

"mg/m^3" means milligrams per cubic metre on a dry basis at 298 K and 101.3 kPa; (*mg/m^3*)

"ng/J" means nanograms per joule; (*ng/J*)

"solid fossil fuel" means coal, or any combination of fuels for which coal is the primary source of usable energy; (*combustible fossile solide*)

"gaseous fossil fuel" means natural gas or propane or any fuel in the gaseous state derived from natural gas or propane; (*combustible fossile gazeux*)

"nitrogen oxides" means all oxides of nitrogen except nitrous oxide, collectively expressed as nitrogen dioxide; (*oxydes d'azote*) "undiluted" means in a condition that does not include air or other gases in excess of the quantity necessary for the normal operating requirement of the boiler; (non dilué)

"smoke density" means the smoke density of a flue gas determined in accordance with the American Society for Testing and Materials (ASTM) designation D 2156-80, reapproved 1988; (densité de la fumée)

"CGSB classification" means the classification of fuel types specified in "National Standard of Canada CAN2-3.2-M81 Fuel Oil, Heating" published by the Canadian General Standards Board, as amended from time to time. (classification de l'ONGC)

Application

3. These Regulations apply in respect of facilities owned or operated by a federal institution.

Duty of Federal Institutions

4. Where a boiler is operated under contract with a federal institution, the federal institution shall ensure that the person who operates the boiler complies with sections 5 to 13.

Prohibition

5. No person shall operate a boiler except in accordance with sections 6 to 13.

Emission Standards for New Boilers

6. The rate of discharge of air contaminants from a new boiler having a heat input capacity greater than 1.5 MJ/s and less than 50 MJ/s shall not exceed

(a) for nitrogen oxides expressed as nitrogen dioxide:

(i) 150 *ng/J* of heat input when fired with solid fossil fuel,

(ii) 110 *ng/J* of heat input when fired with oil specified as type 4, 5, or 6, according to CGSB classification,

(iii) 43 *ng/J* of heat input when fired with oil specified as type 1 or 2, according to CGSB classification, and

(iv) 22 *ng/J* of heat input when fired with gaseous fuel;

(b) for sulphur dioxide:

(i) 500 ng/J of heat input when fired with solid fossil fuel,

(ii) 500 ng/J of heat input when fired with oil specified as type 4, 5, or 6, according to CGSB classification, and

(iii) 25 ng/J of heat input when fired with oil specified as type 1 or 2, according to CGSB classification;

(c) for particulate matter measured undiluted, 160 mg/m^3, when fired with solid fossil fuel; and

(d) for carbon monoxide, 125 ng/J of heat input.

Emission Standards for Existing Boilers

7. (1) Subject to Section 9, effective April 1, 1997, the rate of discharge of nitrogen oxides, expressed as nitrogen dioxide, from an existing boiler having a heat input capacity greater than 5.9 MJ/s and less than 50 MJ/s, shall not exceed

(a) 150 ng/J of heat input when fired with solid fossil fuel;

(b) 110 ng/J of heat input when fired with oil specified as type 4, 5, or 6, according to CGSB classification;

(c) 43 ng/J of heat input when fired with oil specified as type 1 or 2, according to CGSB classification; and

(d) 22 ng/J of heat input when fired with gaseous fuel.

(2) Effective April 1, 1994, the rate of discharge of air contaminants from an existing boiler having a heat input capacity greater than 5.9 MJ/s and less than 50 MJ/s shall not exceed

(a) for sulphur dioxide;

(i) 500 ng/J of heat input when fired with solid fossil fuel,

(ii) 500 ng/J of heat input when fired with oil specified as type 4, 5, or 6, according to CGSB classification, and

(iii) 25 ng/J of heat input when fired with oil specified as type 1 or 2, according to CGSB classification;

(b) for particulate matter measured undiluted, 160 mg/m^3, when fired with solid fossil fuel;

(c) for carbon monoxide, 125 ng/J of heat input.

(3) Subsection (1) does not apply to an existing boiler that is part of a facility described in column I of an item of Schedule I or II, where notice is received by the Minister pursuant to subsection 9 (1) or (3).

Revision of Base Year NO_x Emission

8. (1) For the purposes of this section and section 9

(a) "base year NO_x emission" of nitrogen oxides means for

(i) a facility listed in column I of an item of Schedule I, the total emission, in tonnes, set out in column III of the item, and

(ii) a facility listed in column I of an item of Schedule II, the total emission, in tonnes, set out in column III of that item;

(b) "responsible federal department or institution" means, with respect to a facility, the federal department or institution specified in column II of an item of Schedule I or II, for the facility specified in column I of that item.

(2) Where the responsible federal department or institution requests that the Minister review the base year NO_x emission for a facility, the Minister shall review the base year NO_x emission based on information provided pursuant to subsection (3).

(3) Where a federal department or institution makes a request with respect to a facility pursuant to subsection (2), the department or institution shall provide the Minister, prior to June 1 of any year, with the information required pursuant to Schedules IV and V for the period from April 1 of the preceding for the period from April 1 of the preceding year to March 31 of that year for that facility.

(4) The Minister shall revise the base year NOx emission for a facility where he is satisfied that such a revision is justified based on the information provided pursuant to subsection (3) and any other information relevant to the control of emissions from that facility.

Reduction of Total Emissions From Existing Boiler Facilities

9. (1) Where an existing boiler having a heat input capacity

greater than 5.9 MJ/s and less than 50 MJ/s is part of a facility described in column I of an item of Schedule I, the responsible federal department or institution shall, after giving written notice to the Minister prior to June 1, 1994, reduce nitrogen oxides emissions from all boilers comprising the facility, in accordance with subsection (2).

(2) For the purposes of subsection (1), emissions of nitrogen oxides from all boilers comprising the facility shall be reduced by:

(a) in the twelve month period commencing April 1, 1995 and ending March 31, 1996, for a facility referred to in Column I of an item of Schedule I, 25 percent of the amount set out in Column III of that item; and,

(b) in the twelve month period commencing April 1, 1997 and ending March 31, 1998, and in any subsequent twelve month period commencing April 1 and ending March 31, for a facility referred to in Column I of an item of Schedule I, 50 percent of the amount set out in Column III of that item.

(3) Where an existing boiler having a heat input capacity greater than 5.9 MJ/s and less than 50 MJ/s is part of a facility described in column I of an item of Schedule II, the responsible federal department or institution shall, after giving written notice to the Minister prior to June 1, 1994, reduce nitrogen oxides emissions from all boilers comprising the facility, in accordance with subsection (4).

(4) For the purposes of subsection (3), emissions of nitrogen oxides from all boilers comprising the facility shall be reduced by:

(a) in the twelve month period commencing April 1, 1995 and ending March 31, 1996, for a facility referred to in Column I of an item of Schedule II, fifteen percent of the amount set out in Column III of that item; and,

(b) in the twelve month period commencing April 1, 1997 and ending March 31, 1998, and in any subsequent twelve month period commencing April 1 and ending March 31, for a facility referred to in Column I of an item of Schedule II, thirty percent of the amount set out in Column III of that item.

(5) For the purposes of subsections (2) and (4) emissions of nitrogen oxides for any twelve month period shall be determined in accordance with Schedule V.

Smoke Density

10. A new boiler having a heat input capacity greater than 1.5 MJ/s and less than 50 MJ/s, and an existing boiler having a heat input capacity greater than 5.9 MJ/s and less than 50 MJ/s shall be operated in such a manner that the smoke density of the flue gases does not exceed

(a) a smoke spot number of 5, when fired with oil specified as type 4, 5, or 6, according to CGSB classification; and

(b) a smoke spot number of 3, when fired with oil specified as type 1 or 2, according to CGSB classification.

Emission Testing

11. (1) For the purposes of sections 5 to 10, emission testing shall be conducted by the operator at least once per year on the date and at the location specified in a written notice received by the Minister no less than 30 days in advance of the day on which the testing is to be conducted.

(2) The notice referred to in subsection (1) shall specify the reference methods and test procedures to be used.

(3) Where requested by the Minister, emission testing shall be conducted in the presence of an inspector.

(4) An emission test required under subsection (1) shall be conducted using the following test methods:

(a) for nitrogen oxides the reference method specified in the Department of the Environment Report EPS 1/RM/15, "Reference Method for the Monitoring of Gaseous Emissions from Fossil-Fuel Fired Boilers", as amended from time to time;

(b) for particulate matter, the reference method specified in the Department of the Environment Report EPS 1-AP-74-1, "Standard Reference Methods for Source Testing: Measurement of Emissions of Particulates from Stationary Sources", as amended from time to time;

(c) for sulphur dioxide, the reference method specified in the Department of the Environment Report EPS 1/RM/15, "Reference Method for the Monitoring of Gaseous Emissions from Fossil-Fuel Fired Boilers", as amended from time to time;

(d) for carbon monoxide, the reference method specified in the Department of the Environment Report EPS 1/RM/15, "Reference Method for the Monitoring of Gaseous Emissions from Fossil-Fuel Fired Boilers", as amended from time to time; and

(e) for smoke density, in accordance with the American Society for Testing and Materials (ASTM) Designation D 2156 - 80, reapproved 1988.

(5) Emission testing required pursuant to subsection (1) shall consist of

(a) one test conducted during operation of the boiler between thirty percent and forty percent of maximum rated capacity; and

(b) one test conducted during operation of the boiler between sixty percent and seventy percent of maximum rated capacity.

(6) The rate of discharge of an air contaminant is the arithmetic mean of the test results referred to in paragraphs 5 (a) and (b).

Notice

12. Where a new boiler having a heat input capacity greater than 1.5 MJ/s and less than 50 MJ/s commences operation the owner or operator of the facility where the boiler is located shall, within 60 days of the boiler commencing operation, notify the Minister in writing of the date of commencement of operation, the location, and the heat input capacity of the boiler.

Reporting

13. (1) A report on the results of any tests conducted pursuant to section 11 shall be submitted to the Minister in writing in the format set out in Schedule III no later than sixty days after the day on which the test was completed.

(2) For the purposes of section 9, a responsible federal institution or Department set out in column II of an item of Schedule I or II, shall submit to the Minister, no later than June 1 of each year, in the form set out in schedules IV and V for each facility set out in column I of that item

(a) a report indicating total NO_x emissions for the preceding period of April 1 to March 31; and

(b) such further information as the Minister requests.

SCHEDULE I

(Sections 7, 8, 9 and 11)

Item	Column I Facility Name	Location	Column II Responsible Fed. Dept. or Institution	Column III Base Year NOx Emission (tonnes)
1.	Vedder Cr.	Chilliwack, B.C.	Dept. of Nat. Defence	4.5
2.	Colwood	Esquimalt, B.C.	Dept. of Nat. Defence	0.06
3.	Main CHP	Cold Lake, Alta.	Dept. of Nat. Defence	23.3
4.	Bldg. #237	Edmonton, Alta.	Dept. of Nat. Defence	2.8
5.	Greisbach	Edmonton, Alta.	Dept. of Nat. Defence	9.5
6.	Lancaster	Edmonton, Alta.	Dept. of Nat. Defence	3.2
7.	Plant #1	Moose Jaw, Sask.	Dept. of Nat. Defence	10.8
8.	Plant #1	Winnipeg, Man.	Dept. of Nat. Defence	12.3
9.	Plant #2	Winnipeg, Man.	Dept. of Nat. Defence	9.7
10.	A-154	Borden, Ont.	Dept. of Nat. Defence	21.7
11.	McNaughton	Kingston, Ont.	Dept. of Nat. Defence	31.1
12.	Wolseley	London, Ont.	Dept. of Nat. Defence	5.4
13.	Plant #1	North Bay, Ont.	Dept. of Nat. Defence	9.3
14.	Rockliffe	Ottawa, Ont.	Dept. of Nat. Defence	10.6
15.	Uplands	Ottawa, Ont.	Dept. of Nat. Defence	25.7
16.	Plant 734	Petawawa, Ont.	Dept. of Nat. Defence	24.5
17.	Downsview #1	Toronto, Ont.	Dept. of Nat. Defence	13.7
18.	Downsview #4	Toronto, Ont	Dept. of Nat. Defence	4.2
19.	Main CHP	Trenton, Ont.	Dept. of Nat. Defence	14.6
20.	Plant #1	Bagotville, Que.	Dept. of Nat. Defence	12.1
21.	Long Point	Montreal, Que.	Dept. of Nat. Defence	23.5
22.	St. Hubert	Montreal, Que.	Dept. of Nat. Defence	7.5
23.	CHP-151	Saint-Jean, Que.	Dept. of Nat. Defence	9.1
24.	Plant #5	Valcartier, Que.	Dept. of Nat. Defence	8.8
25.	Main CHP	Goose Bay, Nfld.	Dept. of Nat. Defence	15.3
26.	Int. Airport	Calgary, Alta.	Transport Canada	9.2
27.	Int. Airport	Edmonton, Alta.	Transport Canada	4.5
28	Airport	Winnipeg, Man.	Transport Canada	4.3
29.	Pearson Apt.	Toronto, Ont.	Transport Canada	11.4
30.	Dorval Apt.	Montreal, Que.	Transport Canada	15.2
31.	Mirabel Apt.	Montreal, Que.	Transport Canada	6.5
32.	A.D.R.I.	Nepean, Ont.	Public Works Canada	4.8
33.	580 Booth St.	Ottawa, Ont.	Public Works Canada	14.5
34.	Cliff St.	Ottawa, Ont.	Public Works Canada	64.8
35.	Exp. Farm	Ottawa, Ont.	Public Works Canada	11.4
36.	N.D.M.C.	Ottawa, Ont.	Public Works Canada	21.4
37.	Tunney's Past.	Ottawa, Ont.	Public Works Canada	40.7
38.	Confed. Hghts.	Ottawa, Ont.	Public Works Canada	13.2
39.	Institution	Drumheller, Alta.	Correctional Services	4.7
40.	Sask. Pen.	Prince Albert, Sask.	Correctional Services	7.7
41.	Institution	Stonymount, Man.	Correctional Services	6.3
42.	Institution	Joyceville, Ont.	Correctional Services	5.4

SCHEDULE I (continued)
(Sections 7, 8, 9 and 13)

Item	Column I Facility Name	Column I Facility Location	Column II Responsible Fed. Dept. or Institution	Column III Base Year NOx Emission (tonnes)
43.	Warkworth	Campbellford, Ont.	Correctional Services	2.8
44.	Institution	Millhaven, Ont.	Correctional Services	4.3
45.	Penitentiary	Cowansville, Ont.	Correctional Services	4.7
46.	Leclerc Inst.	Laval, Que.	Correctional Services	17.3
47.	St. Anne Pen.	St. Anne, Que.	Correctional Services	6.8
48.	Montreal Rd.	Ottawa, Ont.	Nat. Research Council	14.5
49.	Shirley's Bay	Ottawa, Ont.	Communications Canada	4.0
50.	Training Acad.	Regina, Sask.	Royal Can. Mtd. Police	6.2
51.	Whiteshell Lab	Pinawa, Man.	Atomic Energy of Canada	10.3
52.	Gateway M.P.P.	Mississauga, Ont.	Canada Post Corporation	5.5

SCHEDULE II

(Sections 7, 8, 9 and 12)

Item	Column I Facility Name	 Location	Column II Responsible Fed. Dept. or Institution	Column III Base Year NOx Emission (tonnes)
1.	Plant #1	Comox, B.C.	Dept. of Nat. Defence	18.9
2.	Dockyard	Esquimalt, B.C.	Dept. of Nat. Defence	23.7
3.	Plant #1	Chatham, N.B.	Dept. of Nat. Defence	20.7
4.	B-1891-56	Cornwallis, N.S.	Dept. of Nat. Defence	48.8
5.	Plant #1	Greenwood, N.S.	Dept. of Nat. Defence	18.1
6.	Plant #2	Greenwood, N.S.	Dept. of Nat. Defence	20.9
7.	Dockyard	Halifax, N.S.	Dept. of Nat. Defence	76.1
8.	Stadacona	Halifax, N.S.	Dept. of Nat. Defence	31.0
9.	Windsor Pk.	Halifax, N.S.	Dept. of Nat. Defence	21.5
10.	Plant #1	Shearwater, N.S.	Dept. of Nat. Defence	41.0
11.	CFB Gagetown	Oromocto, N.B.	Dept. of Nat. Defence	61.9
12.	CFB Summerside	Summerside, P.E.I.	Dept. of Nat. Defence	90.0
13.	Dorchester Pen	Dorchester, N.B.	Correctional Services	9.3
14.	Chalk Riv. Lab	Chalk River, Ont.	Atomic Energy of Canada	73.8

PRESENTATION ON FEDERAL PROGRAMS COVERED BY THE OTTAWA AND TORONTO OFFICES OF CONSERVATION AND PROTECTION, ONTARIO REGION

Dale Cameron, Manager, Ottawa District Office
Environmental Protection, Ontario Region, Environment Canada

PRESENTATION
ON
FEDERAL PROGRAMS
OF THE
OTTAWA AND TORONTO OFFICES
OF
CONSERVATION & PROTECTION - ONTARIO REGION

INTRODUCTION:

The split in responsibilities between the Ottawa District Office (O.D.O.) and the Toronto Regional Office with respect to the operations and activities of Federal Departments Agencies and Crown Corporations (i.e. Federal clients) may be confusing to organizations outside Environment Canada. This presentation is an attempt to clear up some of that confusion, or at a minimum to explain why things are the way they are.

OTTAWA DISTRICT OFFICE:

In April 1989 the overall responsibility for most programs dealing with Federal clients throughout Ontario was transferred from the Toronto office to the O.D.O. The O.D.O. was already heavily involved with Federal operations, both at a Regional level and with many Headquarters components. It had developed expertise in dealing with Federal clients and their problems in a very concentrated area, the National Capital Region and Eastern Ontario. It therefore was a logical transfer of responsibilities. The Ottawa District Office then took on a dual role of delivery of general Environmental Protection Programs (i.e.not related to Federal clients) in Eastern Ontario, and delivery of Federal Programs throughout Ontario. Therefore depending on the hat being worn, it is operating either as the Ottawa District Office or the Federal Programs Office. For anyone in this audience, your dealings will always be with the Federal Programs Office portion of our operation, regardless of the location of your site (i.e.- Eastern Ontario or anywhere else in the Province of Ontario).

Responsibility for a number of subject areas related to specific Federal activities was retained in the Toronto Regional Office, and those will be described later in this paper.

The O.D.O./Federal Programs Office activities related to Federal operations and activities can be subdivided into several chunks:

1. Compliance Promotion
2. Environmental Emergencies
3. Enforcement & Compliance.

COMPLIANCE PROMOTION:

Our role in this important area, is to provide technical advice and assistance, to the limit of our resources, on questions related to:

- wastewater treatment
- solid waste management
- hazardous wastes management
- air emissions
- PCBs management
- underground storage tank management
- contaminated sites clean-up
- environmental audits
- general environmental protection measures
- existing and proposed regulations (provincial/Federal)

Our objectives are to help our Federal clients understand the various environmental requirements they must presently address, to support those who wish to go beyond the strictly "legal" requirements, and ultimately to have good environmental practices in place at all Federal facilities in Ontario.

We accomplish those objectives in a number of ways by:

- sponsoring conferences or workshops like this one
- preparing and providing pamphlets, newsletters, reports on subjects of interest to our clients.
- collecting data on your operations to enable us to reach specific audiences with our information
- day-to-day response to telephone enquiries
- conducting site visits to assess problems
- attendance at client-sponsored seminars or workshops
- participation in joint efforts (projects) with clients
- promoting, at our Headquarters, Regional concerns or problems brought to our attention by our clients.

ENVIRONMENTAL EMERGENCIES:

Our primary role here is to respond to environmental emergencies (i.e.- spill incidents) resulting from the actions of Federal clients (on or off their property), that may have occurred on Federal lands (but caused by others), or that may have occurred adjacent to Federal lands but have the potential to affect the environment of Federal lands. The response area for staff operating out of the Ottawa District Office is Eastern Ontario (See Attachment 1). The specific actions taken by staff will be:

- depending on seriousness of the incident, provide on-scene presence and, as appropriate, direction/advice to the on-scene commander (client representative)
- conduct assessment of clean-up procedures implemented
- conduct post-mortem of the incident when procedural or equipment/training shortcomings are noted

Our secondary role is to provide a similar type of role as in the compliance promotion area but directed specifically at the prevention of spill and emergency incidents. For example:

- provide information to clients re training sessions, new equipment, spill clean-up contractors and new technologies.
- provide advice on development of site contingency plans

ENFORCEMENT & COMPLIANCE:
There are 2 full-time CEPA/Fisheries Act Enforcement Officers operating out of the Ottawa District Office. Their geographical area of responsibility is as shown in Attachment 1. In addition to enforcing Part IV Regulations of CEPA, which will probably be the context in which you will see them most, they also are tasked with enforcing other CEPA Regulations and some areas of the Fisheries Act relating to pollution. Unlike the staff who are working on the Compliance Promotion portion of my program, these Enforcement Officers are not out there as advisors or to provide you with technical advice and assistance - they are there to determine if you are in compliance with the Regulations. It is important that you make that distinction. They operate within the constraints imposed on them by the CEPA and the CEPA Enforcement and Compliance Policy.

TORONTO REGIONAL OFFICE:
Reference was made before to the splitting of responsibilities between the Toronto office and the Ottawa District Office in 1989. For the same reason that many of the Federal Programs responsibilities were re-assigned to the Ottawa District Office on behalf of the Region (expertise, experience, geography), a similar assignment of other programs related to Federal activities was made to the Toronto office. Specific Federal activities assigned to the Toronto office were:

- Nuclear programs. Responsibility for all activities related to the Nuclear Fuel Cycle reside in the Environmental Contaminants and Nuclear Programs Division in Toronto.

- Dredging and Harbours. There is a strong link between these activities and many of the Great Lakes Programs activities carried out by the Toronto office. Therefore it was logical to leave that subject area (and the associated expertise) with the Pollution Abatement Division, housed in the same building as the Great Lakes Environment Office.

- Environmental Emergencies. Due to geographical limitations (staff travel time to the scene of incidents), a response capability is provided out of the Toronto office, Assessment and Environmental Emergencies Office, for all those "Federal" spills occurring outside the Eastern Ontario area outlined previously. If the clean-up develops into a lengthy process (i.e.- greater than 3 or 4 days), there may be a "hand-off" to the Ottawa District Office to see it through to completion. The support by the Toronto office in this particular subject area is restricted to incident response (i.e.- does not routinely extend into the prevention area, that remains with O.D.O for the whole Region).

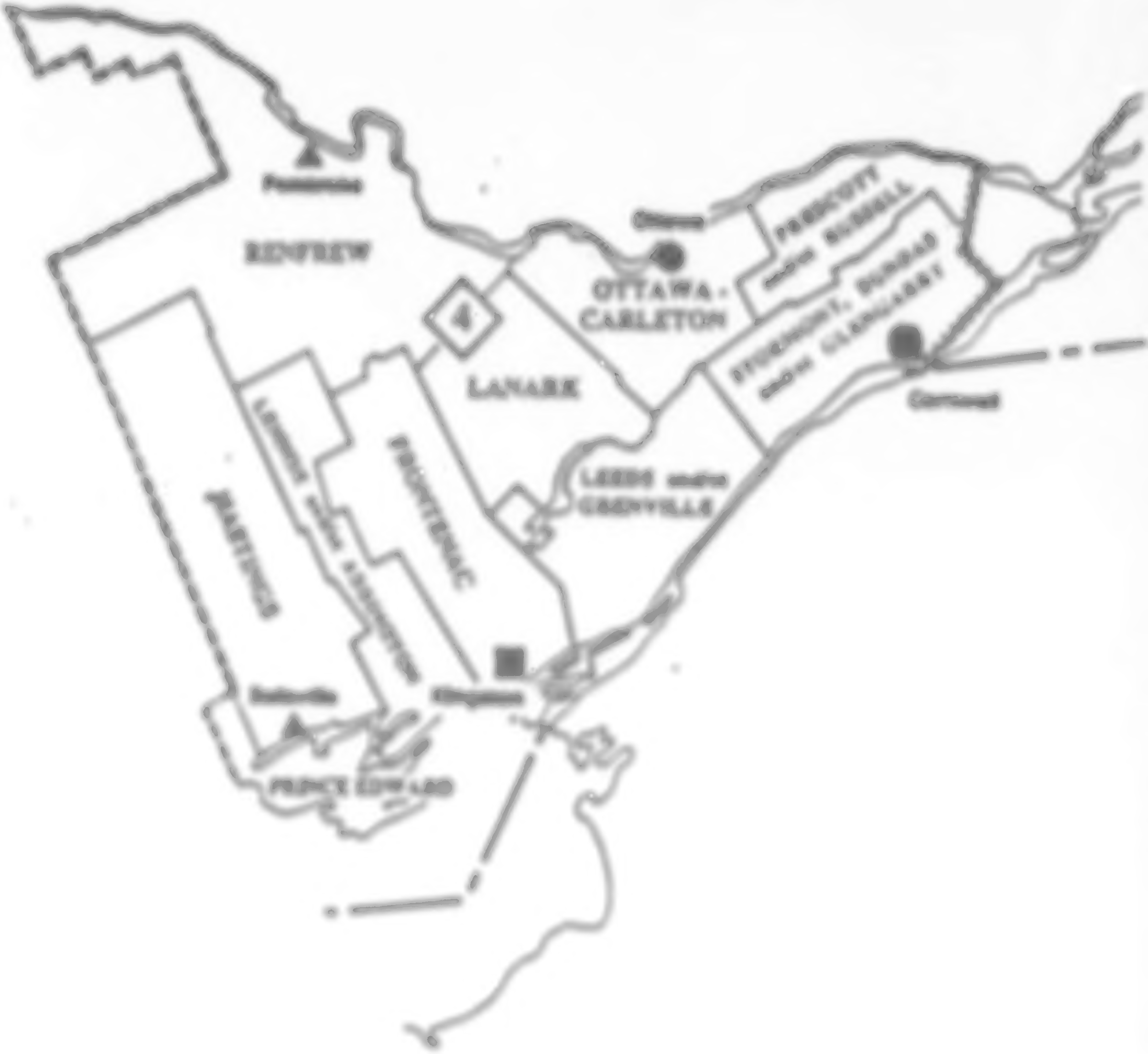
- PCB Management. For Federal facilities outside the Eastern Ontario area, the Environmental Contaminants and Nuclear Programs Division delivers the PCB management program. Their Enforcement Officers conduct inspections of PCB equipment in use, PCB Waste Storage Sites and PCB Treatment and Destruction projects.

- Transportation of Dangerous Goods Act (Wastes). The program for the TDGA for all Federal facilities in Ontario shipping wastes to another province or another country is administered by the Environmental Contaminants and Nuclear Programs Division in our Toronto office.

If your Facility is located outside Eastern Ontario, you should be approaching the Ottawa District Office - Federal Programs Office (at 49 Camelot Drive, Nepean, Ontario, K1A 0H3) with your concerns/questions/suggestions for all environmental subjects EXCEPT those assigned to the Toronto office as outlined above. Attachment 2 outlines the best initial contact for you for both the Toronto Regional and Ottawa District Office for selected subject areas.

ATTACHMENT 1

EASTERN ONTARIO AREA OF RESPONSIBILITY


Pembroke
RENFREW
Ottawa
OTTAWA-CARLETON
PRESCOTT and RUSSELL
STORMONT, DUNDAS and GLENGARRY
Cornwall
4
LANARK
LEEDS and GRENVILLE
FRONTENAC
LENNOX and ADDINGTON
HASTINGS
Belleville
Kingston
PRINCE EDWARD

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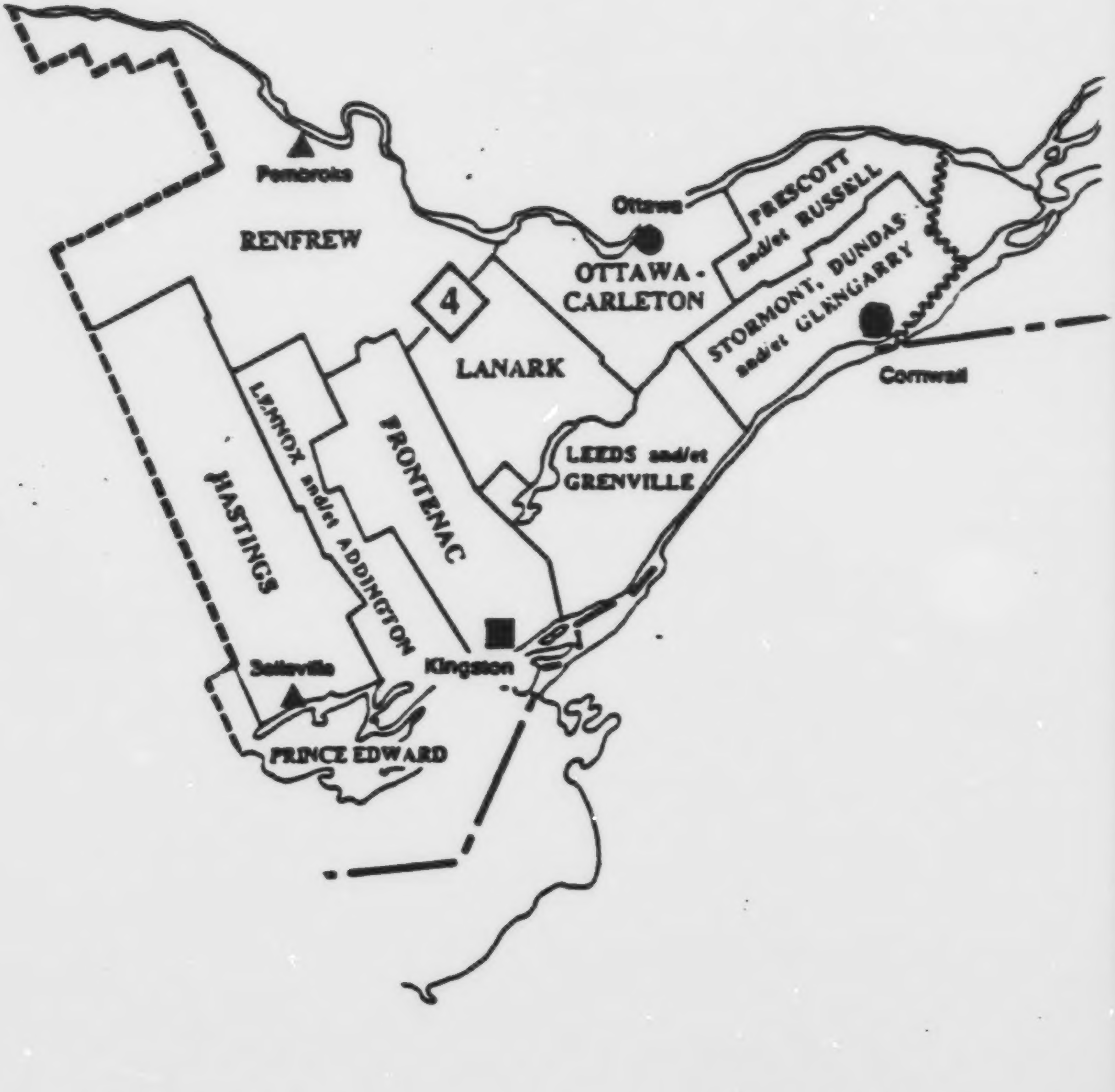

Pembroke
RENFREW
Ottawa
4
OTTAWA-CARLETON
PRESCOTT and/et RUSSELL
STORMONT, DUNDAS and/et GLENGARRY
Cornwall
LANARK
LENNOX and/et ADDINGTON
FRONTENAC
HASTINGS
LEEDS and/et GRENVILLE
Belleville
Kingston
PRINCE EDWARD

ATTACHMENT 2

CONTACTS IN TORONTO REGIONAL & OTTAWA DISTRICT OFFICE

OTTAWA DISTRICT OFFICE (FEDERAL PROGRAMS):

COMPLIANCE PROMOTION

Lawrence King (613-952-8679) - Wastewater Discharges, Air emissions, environmental audits, recycling/green office, waste reduction, environmental assessments.

Frank D'Addario (613-952-8678) - Underground Storage Tanks, contaminated sites, landfills, environmental emergencies.

ENVIRONMENTAL EMERGENCIES
Ron Nobes - after May 15,1991 - (613-952-8678)
Frank D'Addario - until May 15, 1991 - (613-952-8678)
24 HOUR EMERGENCY NUMBER - 613-239-6065

ENFORCEMENT & COMPLIANCE
Marcel DeBellefeuille (613-952-8680)
Paul Madore (613-952-8676)

GENERAL ENQUIRIES
Shirley Watt (613-952-8675)

TORONTO REGIONAL OFFICE:

NUCLEAR PROGRAMS
Sandra Weston (416-973-1060)

PCBs, IN USE EQUIPMENT
Mark Vanderlaan (416-973-1080)

PCB WASTE STORAGE & TREATMENT
Craig Wardlaw (416-973-1081)

TRANSPORTATION OF DANGEROUS GOODS (WASTES)
Stewart Teasall (416-973-1066)

DREDGING & HARBOURS
Susan Humphrey (416-973-1074)

ENVIRONMENTAL EMERGENCIES
Jean-Patrice Auclair (416-973-1061)
24 - HOUR EMERGENCY NUMBER 416-346-1971

OVERVIEW OF ADDITIONAL FEDERAL REQUIREMENTS APPLICABLE TO FEDERAL FACILITIES IN ONTARIO

Lawrence King, Senior Environmental Officer, Ottawa District Office
Environmental Protection, Ontario Region, Environment Canada

BEYOND CEPA: OVERVIEW OF ADDITIONAL FEDERAL AND PROVINCIAL REQUIREMENTS APPLICABLE TO FEDERAL FACILITIES IN ONTARIO

Lawrence R. King
Senior Environmental Officer
Conservation and Protection Ontario Region
Federal Programs - Environment Canada

Introduction

The Canadian Environmental Protection Act will prove to be a significant statute in terms of its impact on the operations of Federal government departments, agencies and crown corporations. However, at present, many regulations are still under development or only proposed under Part IV. Other sections of CEPA do not necessarily address all areas of environmental concern. It is therefore imperative to also utilize other existing Acts, regulations, guidelines, codes, policies and objectives in achieving environmental protection at Federal facilities.

This paper will first describe the jurisdictional and regulatory regime that exists in Ontario Region today. The various types of regulatory instruments that are used to correct existing pollution problems and preclude future ones from developing will be reviewed. The applicability of Provincial and Municipal requirements to Federal undertakings will be discussed.

Next, an outline of Federal and Ontario environmental Acts and other environmental protection instruments in specified areas will be presented. Requirements in the areas of environmental assessment, water and air quality and hazardous waste management will be described. This will provide only a sampling of the many environmental requirements that currently exist under a myriad of Federal and Provincial legislation. However, the four subject areas chosen are the ones most commonly dealt with by Federal Programs staff when providing assistance and advice to other government departments and crown corporations.

A short list of additional Regulations, Guidelines and Codes used to address issues in other problem areas will also be presented. The last section of the paper will describe the formal and semiformal approval mechanisms that exist at this time as options for Federal Departments, Agencies and Crown Corporations for proposed and existing facilities and pollution control equipment.

Levels of Government and the Application of Environmental Law

Canada was established in 1867 by the British North America Act (now the Constitution Act) as a union of individual political entities, each of which had its own government prior to confederation. In general terms, the Federal government was given jurisdiction over matters considered to be national in scope at the time of confederation.

Some of the exclusive federal powers which may affect environmental protection include the imposition of taxes, the making of criminal laws and the regulation of trade and commerce, navigation and shipping, seacoast and inland fisheries and interprovincial and international works and undertakings or works and undertakings within a province deemed to be for the general advantage of Canada. The federal government also has the general power to make laws for the "peace, order and good government of Canada".

Exclusive provincial powers which may impact on environmental protection include the control of natural resources, the management and sale of public lands belonging to the province, the establishment and control of municipal institutions, power over property and civil rights and power over all matters which are local or private in nature.

A municipality is a special type of corporation granted power by the province to pass legislation in the form of By-laws to deal with local matters within municipal boundaries.

Today's environmental problems and many of the realities of life in the 20th century were unforseen by the fathers of confederation (understandably so). As a result, the generality of some of the language of the original British North America Act has meant that many of today's environmental problems do not fall clearly within Federal or Provincial jurisdiction. The situation is further complicated by the presence of operations under federal jurisdiction (whether federally owned or subject to federal regulation) within various provinces and the legal concept of "jurisdictional immunity".

Jurisdictional immunity is the immunity from provincial legislation which various court cases have established for the federal government and works or undertakings under federal jurisdiction. The federal government has been unwilling to pass legislation which would legally oblige federal entities to comply with provincial requirements and instead, must rely on its own regulations and guidelines. According to the courts then, Federal departments, agencies, crown corporations, federally regulated entities and Federal works or undertakings are bound by Federal regulation, but not by provincial or municipal legislation (presumably there are some exceptions to this).

However, given the reality, complexity and urgency of environmental problems today, it should be considered a corporate duty for federal facilities to comply with all environmental requirements, whether federal, provincial or municipal, especially in light of the fact that legislation at the provincial level is not always paralleled at the federal level. With the federal government's publicly stated goal of putting its own house in order, adherence to all environmental requirements should become the policy of all federal departments, agencies, crown corporations and other entities under federal jurisdiction.

Environment Canada Federal Programs staff in Ontario Region react to all environmental issues at federal facilities under the assumption that in the absence of Federal legislation in a given area of environmental protection, Federal facilities must comply with provincial or municipal requirements. As new federal regulations applicable to operations under federal jurisdiction come on line, we will continue to look to provincial or municipal requirements if they are more comprehensive or more stringent.

Types of Environmental Requirements

Common law and Statute law are the two main bodies of law in Canada. Common law originated with rules established by judges during past centuries in the course of making decisions in disputes brought before the courts. Many of these ancient precedents are still applicable, even in the environmental field, however many new principles are required to address society's conduct in the modern world. To satisfy these needs, the Federal Parliament and the Provincial Legislatures make laws applicable to current situations which are called Statutes or Acts.

An Act generally gives the Minister responsible the power to make regulations or standards, which are legally binding. An administrative system of permits, licences, certificates of approval and control orders may also be established. Other powers, such as the power to require the clean up of a spill or the power to require the providing of information on request may also be included. A statute also creates offenses which are violations of regulations established under the Act, or noncompliance with administrative requirements. The maximum fines for environmental offenses has increased substantially in the last five to six years at both the federal and provincial levels.

Many of the yardsticks by which we measure the environmental status of a given operation are not found in statutes or regulations. Both Environment Canada and the Ontario Ministry of the Environment (MOE) make frequent use of guidelines, objectives, codes of good practice, criteria and policies in the conduct of their work. It should be noted however, that guidelines, objectives, etc. can be written into legally binding documents such as permits, orders or Ontario's Certificates of Approval. Also, noncompliance with a guideline or objective, can be used to refuse approvals under a given Act or Regulation.

Environmental Protection Requirements

This section reviews the federal and Ontario government's requirements in the following specific areas of environmental protection:

1. Environmental Assessment and Review
2. Protection of Water Quality
3. Protection of Air Quality
4. Hazardous Waste Management

Environmental Assessment

1. Federal Requirements

The federal Environmental Assessment and Review Process has been in existence since 1973 and was originally established as a cabinet policy. From the beginning, it has been the purpose of EARP to ensure that the environmental effects of federal projects, programs and activities are assessed early in the planning stages, before any commitments or irreversible decisions are made. The process was intended to be binding on all federal departments and agencies, with the exception of Proprietary Crown Corporations and some federal agencies for whom the process was voluntary. Nonetheless, the process was largely ignored except for larger projects with significant public interest.

In 1984, the process was strengthened and updated when the Environmental Assessment and Review Process Guidelines were issued by an order in Council under the Government Organization Act. This order reaffirmed the original policies and procedures for EARP and more clearly defined roles and responsibilities and the essential need for public participation. EARP was intended to be a planning process rather than a regulatory one. However, even with the issuance of the EARP Guidelines Order, many departments and agencies still did not incorporate environmental assessment into their planning processes.

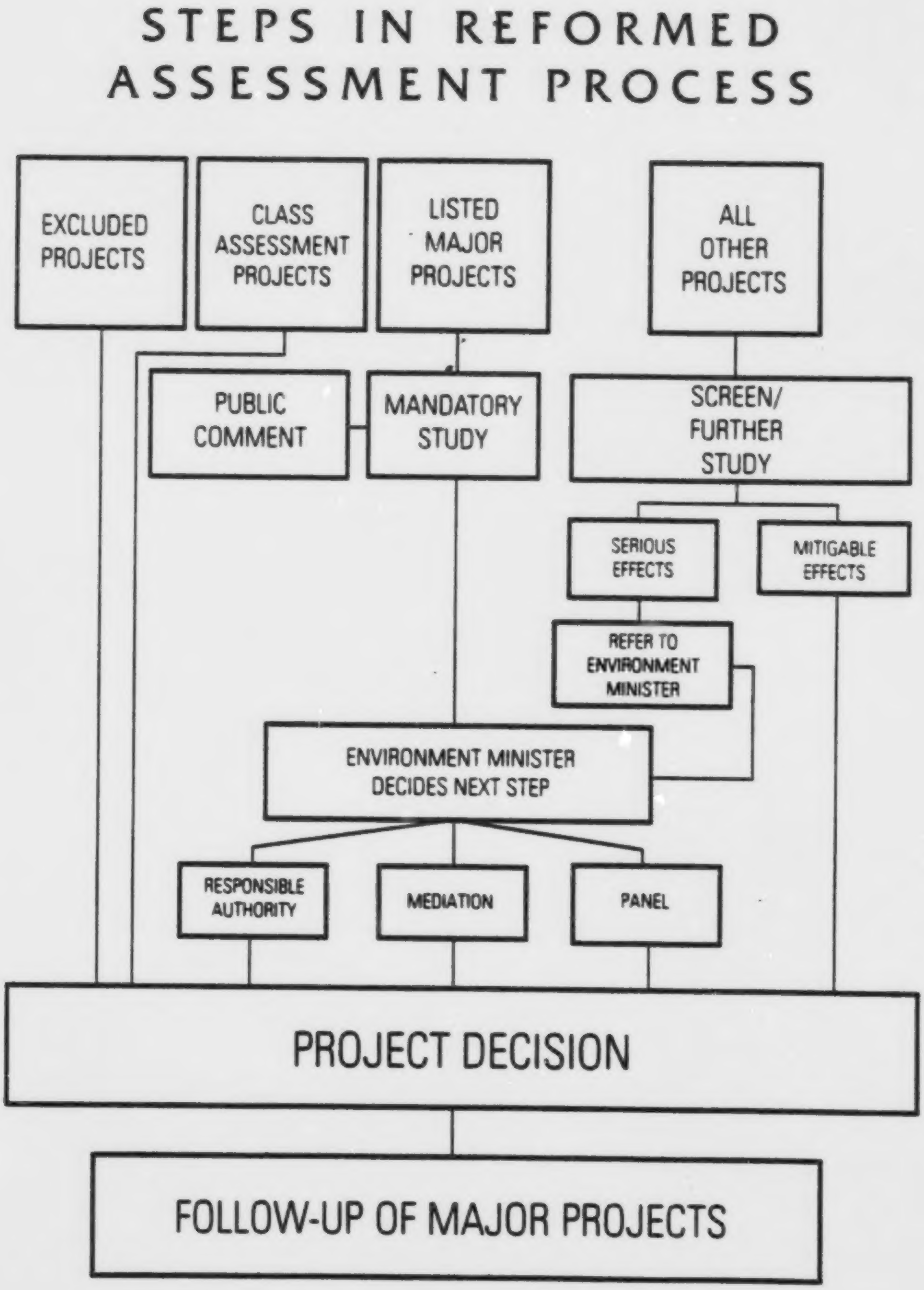
Due in part to public concerns relating to the weakness of the current system, as well as the uncertainty created by recent court decisions based on the EARP Guidelines Order (i.e. Rafferty and Alameda dams in Saskatchewan and the Oldman River dam in Alberta), the government has introduced Bill C-78: Canadian Environmental Assessment Act which will replace the 1984 Order. As of March 1991 the draft Act has gone through first reading in the house and further committee hearings. Proposed amendments to the draft Bill are before the Cabinet Environment Committee.

Unlike the process which it will replace, the Canadian Environmental Assessment Act will make the governments obligation to integrate environmental considerations into all project planning and implementation processes legally binding. The Act will also give the Minister of the Environment an expanded role in deciding whether a given project requires a public review by a panel. A decision in this regard was previously left up to the proponent (initiating department) of the project. New federal policy initiatives with environmental implications will also be subject to the process. A schematic of the process is shown in Figure 1. Further information can be obtained from the Federal Environmental Assessment and Review Office (FEARO).

2. Ontario Provincial Requirements

The Ontario government also has an environmental assessment and review process, similar to the federal one, and which is a

Figure 3: Environmental Assessment Act (Proposed)


STEPS IN REFORMED ASSESSMENT PROCESS
EXCLUDED PROJECTS
CLASS ASSESSMENT PROJECTS
LISTED MAJOR PROJECTS
ALL OTHER PROJECTS
PUBLIC COMMENT
MANDATORY STUDY
SCREEN/ FURTHER STUDY
SERIOUS EFFECTS
MITIGABLE EFFECTS
REFER TO ENVIRONMENT MINISTER
ENVIRONMENT MINISTER DECIDES NEXT STEP
RESPONSIBLE AUTHORITY
MEDIATION
PANEL
PROJECT DECISION
FOLLOW-UP OF MAJOR PROJECTS

legal statute under the Ontario Environmental Assessment Act. Occasionally, a project involves both federal and provincial levels of government. In such cases, a decision is sometimes made to conduct environmental assessment under one or the other process to avoid duplication. However, the provincial process will not apply to most federal projects and it is not further discussed here.

Protection of Water Quality and Requirements for Effluent Treatment

1. Federal Requirements

Provisions for the protection of water quality at the federal level exist under CEPA, as well as the Fisheries Act. Sections 34 to 42 of the Fisheries Act apply specifically to fish habitat protection and pollution prevention in Canadian fisheries waters (waters frequented by fish). Section 35.(1) prohibits the harmful alteration, disruption or destruction of fish habitat (unless authorized). Section 36.(3) prohibits the discharge of a "deleterious substance" into Canadian fisheries waters.

Deleterious substances, whether alone or in solution, are those which degrade or alter or cause the degradation or alteration of water quality so that the water is made harmful to fish or fish habitat, or prevents the use by man of the fish in those waters. The Fisheries Act is being used by Environment Canada to issue warnings to federal facilities causing water pollution of surface waters. In severe cases where warnings are not effective, charges will be laid.

Regulations for effluents discharged by federal facilities are proposed under CEPA Part IV. At present, Environment Canada continues to utilize the 1976 Guidelines for Effluent Quality and Wastewater Treatment at Federal Facilities. The guidelines apply to federal departments, agencies and Crown Corporations, however, they are mainly directed at municipal type effluents which are composed of sanitary and domestic waste with limited commercial and industrial input, and which discharge to surface waters.

The guidelines contain general and specific limits for effluent quality. Specific limits are stated for five day Biochemical Oxygen Demand (BOD5), Suspended Solids, Faecal Coliforms, Phosphorus, etc. Some departments, such as Indian and Northern Affairs, have incorporated these limits into their design manuals. The minimum level of treatment is secondary (i.e. biological), however specific technology or design criteria are not included. Special requirements for lagoon systems, including seasonal retention are included in the guidelines.

2. Ontario Provincial Requirements

The main statutes affecting the preservation of water quality in Ontario are the Ontario Water Resources Act and the Ontario Environmental Protection Act. The OWRA is largely concerned with municipal and industrial sewage treatment and water supply systems.

Sections 14-19 make it an offence to discharge a material of any kind which may impair the quality of surface and groundwater. Section 16 calls for the notification of the Minister of the Environment whenever such a discharge occurs, although provisions for spill notification exist specifically under the Environmental Protection Act.

Section 20 of the OWRA regulates the taking of surface or groundwater. A permit is required for the taking of more than 50,000 litres of water a day from surface or ground water sources. A permit is also required to construct a well in certain areas of the province (Sections 21-22). Water works with a capacity over 50,000 litres per day meant to supply drinking water cannot be established, altered, extended or replaced in Ontario without the approval of a Regional Director of MOE.

In the same vein, sewage treatment facilities also cannot be established, altered, expanded or replaced with new facilities without the approval of a Regional Director of MOE (Section 24). This does not apply to a drainage works for agricultural land which is covered under Ontario's Drainage Act. For specific design requirements, Environment Canada normally looks to the Ontario requirements as contained in the Ministry of the Environment Policy Manual. Section 32 of the OWRA also requires that sewage treatment facilities be maintained, kept in repair and operated in a suitable manner at all times.

New effluent standards for nine industrial sectors discharging to surface waters, as well as municipal sewage treatment plants are being developed currently under the MISA program (the Municipal Industrial Strategy for Abatement). The objective of the MISA program is the virtual elimination of toxic contaminants from Ontario's waterways (at least those discharged from point sources). Under MISA, limitations for approximately 28 industrial sectors discharging into municipal sewer systems are also being prepared. At this time it is still not clear whether MISA will impact on Federal facilities (Petroleum refineries are subject to these requirements, however Petro Canada is being privatised). Any federal sewage plants in excess of two million litres per day will probably be subject to the MISA requirements for municipal sewage treatment.

The Environmental Protection Act contains a number of provisions for the protection of water quality. This includes a general provision in Section 13(1) against the discharge of a contaminant into water which may cause an adverse effect. In addition, Part IX (Sections 79 to 112) addresses spills into water as well as onto land. This is further discussed later in the workshop in the environmental emergencies session and is not discussed further here.

The Ontario policies with regard to water, as well as Ontario's surface water quality objectives are outlined in "Water Management: Goals, Policies, Objectives and Implementation

Procedures of the Ministry of the Environment", known in short as Ontario's "Blue Book" due to the colour of the cover. The Blue Book covers surface and ground water quality and quantity. Special attention is given to areas with water quality which is not meeting water quality objectives. Federal facilities utilizing surface or ground water or discharging treated sewage or other wastewater should be familiar with the Blue Book as it affects their area.

3. Great Lakes Water Quality Agreement

At the international level, for federal facilities in the Great Lakes drainage basin (including the international section of the St. Lawrence River), the revised Great Lakes Water Quality Agreement of 1978 (as amended November 1987) is of special interest. The purpose of the GLWQA is to "restore and maintain the chemical, physical and biological integrity of the Great Lakes basin ecosystem". This agreement provides specific objectives for water quality in the lakes and the St. Lawrence River, as well as outlining specific programs to be undertaken by Canada and the United States.

Special attention is being given to Areas of Concern around the Lakes, which are geographic areas where the general and specific objectives of the GLWQA are not met. This results in the loss of beneficial uses for the area and the impairment of the area's ability to support aquatic life. The 17 Areas of Concern due in full or in part to Canadian activities are (Figure 2):

Lake Superior: Thunder Bay harbour, Nipigon Bay, Jackfish Bay and Peninsula Harbour;

Lake Huron: Spanish River, Penetang Bay to Sturgeon Bay, Collingwood Harbour;

Lake Erie: Wheatley Harbour;

Lake Ontario: Hamilton Harbour, Toronto Harbour, Port Hope Harbour, Bay of Quinte;

Connecting Channels: St. Marys River, St. Clair River, Detroit River, Niagara River, St. Lawrence River;

Federal Facilities operating within the drainage basin of the Great Lakes and the international section of the St. Lawrence River should determine whether their activities in any way impact on Great Lakes water quality or the air shed over the lakes. In addition, those located within any of the above areas of concern should be aware of the ongoing development of Remedial Action Plans (RAPs) for these areas. The RAPs will ultimately present a plan of action for the long term remediation of pollution problems within each of the areas of concern. Any federal facility thought to be a contributor to the degradation of the area of concern will be specifically identified in reports on the Remedial Action Plan (e.g. CFB Trenton in the Bay of Quinte RAP).

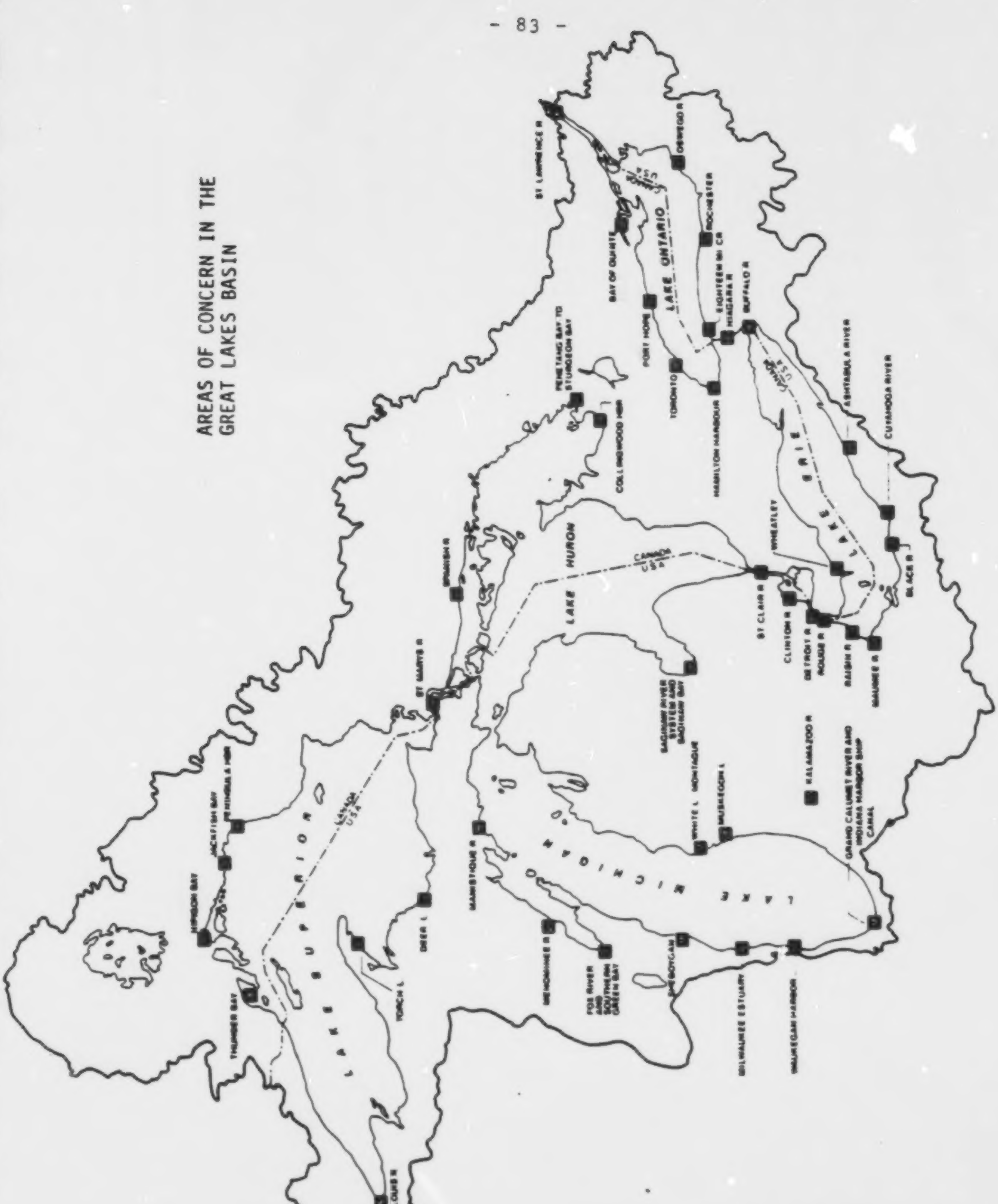

AREAS OF CONCERN IN THE GREAT LAKES BASIN
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
CANADA
USA
ST LOUIS R
THUNDER BAY
NIPIGON BAY
JACKFISH BAY
PENINSULA HBR
TORCH L
DEER L
MANISTIQUE R
MENOMINEE R
FOX RIVER AND SOUTHERN GREEN BAY
SHEBOYGAN
MILWAUKEE ESTUARY
WAUKEGAN HARBOR
GRAND CALUMET RIVER AND INDIANA HARBOR SHIP CANAL
KALAMAZOO R
MUSKEGON L
WHITE L
SAGINAW RIVER SYSTEM AND SAGINAW BAY
ST MARYS R
SPANISH R
PENETANG BAY TO STURGEON BAY
COLLINGWOOD HBR
TORONTO
PORT HOPE
BAY OF QUINTE
HAMILTON HARBOUR
EIGHTEEN MI CR
NIAGARA R
BUFFALO R
ROCHESTER
OSWEGO R
ST LAWRENCE R
ASHTABULA RIVER
CUYAHOGA RIVER
BLACK R
MAUMEE R
RAISIN R
ROUGE R
DETROIT R
CLINTON R
ST CLAIR R
WHEATLEY

Figure 2: Areas of Concern

4. Canadian Council of Ministers of the Environment

Canadian Water Quality Guidelines have been developed over a number of years by CCME and its predecessor CCREM which are applicable to Canadian conditions. In the absence of more stringent local requirements, these guidelines can be useful for assessing possible impacts of proposed projects under EARP or for determining an impact due to an ongoing situation. Specific guidelines (inorganic parameters, metals, pesticides, other organics, bacteria, etc.) have been developed for various water uses such as raw water for drinking water supplies, recreational water use, the protection of aquatic life, etc.

For the protection of groundwater supplies, the CCME Environmental Code of Practice For Underground Storage Tank Systems Containing Petroleum Products is proving very useful. This Code is being actively applied by Environment Canada in Ontario Region in addressing problems due to leaking underground storage tanks. This is discuss in further detail in the session on underground storage tanks later in this workshop.

5. Municipal Sewer Use By-laws

Most municipalities within Ontario have passed a By-Law controlling the discharge of contaminants into municipal sanitary and storm sewers. These By-Laws are based on a model periodically updated by the Ontario MOE. An example is the Regional Municipality of Ottawa Carleton By-Law No. 208 of 1984, a "By-Law to Govern Sewers and Sewage Treatment Works and the Discharge of Industrial Wastes into Municipal Sewers". The term "Industrial" in the provincial model, is intended to include commercial and institutional facilities, including government operations.

Municipal By-Laws have specific prohibitions for discharges into regional or municipal surface drains, storm sewers, sanitary sewers and combined sanitary/storm sewers. For example, the RMOC Sewer Use By-Law has general and numerical concentration limits for the content of water discharged into sanitary sewers (Section 10) and storm sewers (Section 11). These include the exclusion of storm water from sanitary sewers, the prohibition of discharges of solvents, explosive matter, excessive biochemical oxygen demand, excessive suspended solids, heavy metals, etc. Federal facilities discharging into municipal sewer systems should be aware of their own discharges as measured against the By-law limits of a given municipality.

Protection of Air Quality

1. Federal Requirements

The division of powers between the Federal and Provincial governments delegates the primary jurisdiction for air pollution control to the provinces. However, the federal government has primary jurisdiction over air pollution originating with federal facilities or undertakings under federal jurisdiction, emissions of contaminants in quantities or concentrations which constitute a danger to human health, emissions of pollutants which can result in the violation of international agreements and the composition of fuels or fuel additives. Environment Canada's mandate in this area falls under the Canadian Environmental Protection Act. These air pollution provisions originated with the former Clean Air Act which was incorporated into CEPA.

In the majority of cases where Federal Programs staff are involved with air emissions from point sources from federal department or crown corporation facilities, there is a likelihood that the emissions will originate with one of four principal areas: equipment used to generate building heat, laboratory fume hoods, nonhazardous waste incinerators and paint shops. Other types of sources are encountered less frequently. Outside of CEPA, there are currently no other Acts or Regulations directly applicable to the above mentioned types of sources.

The upcoming CEPA regulations for boilers and incinerators apply to systems of a certain magnitude. Existing boilers with a heat input capacity over 20 million Btu/hour or new boilers over 5 million Btu/hour are subject to the regulations. Incinerators with a capacity over 1,000 kg/day will be subject to the federal incinerator regulations. For smaller installations, older federal guidelines exist, however, more current provincial requirements should be consulted for these facilities (see below). For fume hoods and paint shops, the provincial requirements are the only ones available.

Transport Canada has additional legislation under other federal Acts which apply to emissions from transportation sources such as ships, aircraft, trucks, automobiles and railway engines.

2. Provincial Requirements

Legislation pertained to the protection of air quality in Ontario falls under the Environmental Protection Act. Many of the general provisions of the EPA and requirements such as Certificates of Approvals which were discussed previously in regards to water, are directly applicable to the discharge of contaminants into air. For instance, Section 13(1) states that "no person shall discharge a contaminant or cause or permit the discharge of a contaminant into the natural environment that causes or is likely to cause an adverse effect". Section 8(1) prohibits the operation of any facility which discharges a contaminant into the natural environment unless the operator has first obtained a Certificate of Approval from the Ministry of the Environment.

In addition to the general provisions of the EPA, Ontario has also passed Air Pollution Regulation 308. Exemptions for the above noted requirement for a C of A, are only allowed for fuel burning equipment used for heating which uses natural gas or number two fuel oil at a rate of less than 1.5 million Btu/hour, domestic residences and highway construction equipment. Any other sources emitting contaminants require MOE approval.

Regulation 308 also prescribes air pollution standards which are maximum concentrations for 100 contaminants at the point of impingement. The regulation gives a methodology for calculating the point of impingement concentration if the concentration emitted from a stack is known. The Regulation also has general provisions against the discharge of any contaminant which causes material discomfort or loss of enjoyment of property, as well as limitations against visible emissions.

Any federal facility should have a complete inventory of its emission sources and should ensure that a Certificate of Approval is obtained prior to the construction of a new source. Information on existing equipment and sources should be submitted to the Ministry for review as outlined below in the section on Review and Approval Mechanisms.

Hazardous Waste Management

1. Federal Requirements

Federal requirements in this area are minimal in terms of facilities located in Ontario which generate hazardous wastes, store them on-site and utilize the services of a commercial hauler to transport them by provincial roadway to a hazardous waste disposal site. International and interprovincial transport is not discussed here. Until regulations are developed under Part IV of CEPA, the Ontario requirements should be followed.

2. Provincial Requirements

Generators of hazardous waste are responsible for ensuring that theirs wastes are handled, transported and disposed of in compliance with all environmental regulations. The existing system in Ontario utilizes manifests to track the movement of hazardous wastes from generator, to hauler, to final disposal. The basis for Ontario's hazardous waste regulation (Regulation 309) is Part V of the Ontario Environmental Protection Act (Waste Management, Sections 24-47).

Regulation 309 requires that generators evaluate their wastes to determine whether they are Hazardous or Liquid Industrial wastes as defined by the regulation. The Ministry of the Environment has published the "Registration Guidance Manual for Generators of Liquid Industrial and Hazardous Waste, June 1990" to help generators comply with the generator registration requirements of Regulation 309. A provincially licensed hazardous waste hauler will not jeopardize his license by picking up wastes from a site which has not received a Hazardous Waste Generator Number from MOE. Once registered, it is the responsibility of the generator to register any new types of wastes generated as the function of the facility changes or new waste generation processes come on line. Many of these regulatory requirements have been in place since the early 1980's, yet we are still finding federal generators which require registration.

Hazardous wastes include nine different categories of chemical, industrial, corrosive, reactive, radioactive, pathological and PCB wastes. Industrial wastes include those generated by manufacturing or commercial processes, storage and warehousing facilities, research facilities, clinics, schools, hospitals and laboratories. Essentially any kind of non-residential facility can qualify as a generator of hazardous or liquid industrial waste depending on the activities which occur at the site. Regulation 309 also has specific provisions applicable to asbestos waste (Section 14).

In addition to Hazardous and Liquid Industrial Wastes, the regulation also requires the registration of specific solid wastes. Such solid wastes are those, which when subjected to the regulation's "Leachate Extraction Procedure", generate a leachate containing contaminants a concentrations 10 and 100 times the levels specified in the regulation.

The regulation contains small quantity exemptions for some of the above wastes which reduces the burden on small generators and exempts households from the regulation. Small quantity exemptions vary with the type of waste and include one kilogram per month of acute hazardous waste chemicals and hazardous waste chemicals as defined by the regulation, 5 kg per month for hazardous industrial wastes, corrosive wastes, reactive wastes, leachate toxic wastes and ignitable wastes, as defined, . There is no small quantity exemption for severely toxic wastes or pathological wastes,. Other wastes that are specifically exempted from the regulation are: Agricultural Wastes, Condemned animals or parts from meat processing plants, dead animals to which the Dead Animal Act applies, hauled sewage, inert fill, rock fill or mill tailings from a mine and recyclable material (as defined, if transported directly from generator to recycling site).

One common problem which Federal Programs staff frequently encounter at federal facilities is poor storage practices for hazardous waste. Regulation 309 requires that generated wastes be removed from the generation site within 90 days. This limit can be exceeded if the MOE is notified, however this is often not done. In addition, many federal storage facilities are outdoors, unprotected from the elements and often on gravel or the ground. Spills are frequent and often not cleaned up. Drums and containers are often unlabled and the contents may not be known with certainty.

Many federal sites are in the process of modernizing their storage practices. Federal facilities should store hazardous wastes within an enclosed structure which has a curbed floor capable of containing spills. Such a facility does not necessarily require a power source. Spill cleanup materials and equipment must be present and staff must know what to do with them. The compatibility of various wastes should also be given consideration. For example, acid wastes should be segregated from solvent wastes. These recommendations are more best management practices, as opposed to specific guidelines, although attention should be given to the provisions of the National Fire Code and the National Building Code, both of which are available from the National Research Council. Poor storage practices can lead to violations of general provisions of the Environmental Protection Act regarding the discharge of contaminants to the environment.

Other Environmental Protection Instruments

The following is a brief sampling of additional materials available to Federal Programs staff in assessing pollution problems at federal facilities:

1. Federal

1. Sanitary Landfilling Guidelines For Federal Agencies

The Sanitary Landfilling Guidelines are based on the most stringent of such requirements for the ten provinces. This document contains minimum requirements for the construction, operation and closure of sanitary landfills on federal property. A summary of the provincial requirements is also contained in tabular form as an appendix to the guidelines.

2. Code of Practice for the Reduction of CFC Emissions from Refrigeration and Air Conditioning Systems

These guidelines cover the design, manufacture, installation, servicing and usage of equipment containing CFCs, HFCs and HCFCs. Further information is provided on methods for the recovery, reuse and disposal of refrigerants, as well as recommendations for handling and storage.

2. Provincial

1. Guidelines for the Utilization of Sewage Sludges on Agricultural Land

These guidelines limit the nutrient to metal ratios allowed for the application of treated (stabilized) sewage sludge on agricultural land. This method of sludge disposal is an effective way of using sludge for fertilizer as opposed to dumping it in a landfill where it serves no useful purpose.

2. Guidelines for the Decommissioning and Cleanup of Sites in Ontario

The Decommissioning Guidelines apply to the mothballing, partial closure or complete closure of facilities. The objective of decommissioning and clean up is to restore the environment of the site to a degree that makes the property suitable for future uses such as residential development.

Review and Approval Mechanisms for Federal Facilities in Ontario

1. Environment Canada

Environment Canada has a dual role in the environmental protection field. The enforcement of regulations has recently been given greater attention by the department, especially since the Canadian Environmental Protection Act came into force three years ago. However, we are also continuing our historic role of providing assistance and advice to other government departments and crown corporations. A major area that is lacking in our program is an official permit system or formal approval mechanism for pollution control facilities or other facilities affecting the environment.

Instead, our normal approach is to review design documents or reports and to provide written comments stating whether the proposed facility or changes to an existing facility are in line with existing regulations, guidelines or codes. Due to limited resources, we are only able to process a limited number of such reviews each year. Nonetheless, many departments are calling for such reviews by Environment Canada as part of the in-house approval mechanism for new projects.

2. Ontario Ministry of the Environment

The legislation administered by the Ontario MOE involves a system of licences and permits termed "Certificates of Approval". For example, in Ontario, it is illegal to build a new sewage plant or start a new waste disposal site without first obtaining a Certificate of Approval (C of A). Due to jurisdictional immunity, this system of permits has generally not been applied to facilities under federal jurisdiction. However, we are finding the Ministry increasingly willing to run federal design reports through the Ontario approval system. This has been done frequently in the last few years for new fume hoods at federal laboratories within the Ottawa area.

Environment Canada Federal Programs Staff are encouraging federal facilities to submit an "Application for a Certificate of Approval" to the Ministry of the Environment for new or significantly altered Air, Water, Sewage and Waste Disposal projects. For existing facilities never subjected to this approval process, an alternative exists. An Application for a C of A can now be submitted, however the covering letter to the Ministry should ask that MOE review the application to determine whether the design of the facility meets their requirements, as opposed to issuing a C of A, since MOE can not legally issue a Certificate for an existing facility.

In some cases, it is not possible to operate a facility without fully complying with the Ontario requirements, as is the case for Registered Generators of Hazardous Waste. Without such registration, no licensed waste hauler will be willing to collect a facility's waste for off site disposal.

Conclusion

It was not possible within the confines of this paper to discuss the entire spectrum of federal and provincial acts, regulations, guidelines and other instruments applicable to the environmental protection field. However, it is evident that the Canadian Environmental Protection Act alone does not cover all areas of environmental protection. In addition, the federal legislation and other applicable federal documentation also does not fully cover all possible activities occurring at federal facilities which may impact on the environment.

Jurisdictional immunity not withstanding, the management and staff of all facilities under federal jurisdiction have an obligation to ensure that they operate in a manner which least impacts on the environment and which complies with the intent and specific requirements of all environmental legislation, whether federal, provincial or municipal.

References

1. Estrin, D. and Swaigen, J. "Environment on Trial: A Handbook of Ontario Environmental Law", Canadian Environmental Law Research Foundation, 1978;

2. FEARO, "The Federal Environmental Assessment and Review Process", Federal Environmental Assessment Review Office;

3. House of Commons of Canada. "Consolidation of the Fisheries Act with Amendments - Bill C-74", as passed by the House of Commons December 12, 1990 (Royal Assent January 17, 1991);

4. Minister of the Environment, "Federal Environmental Assessment New Directions", Press Package released with June 18, 1990;

5. Poch, H. "Corporate and Municipal Environmental Law", The Carswell Company Limited, 1989;

6. Saxe, D. "Environmental Offenses: Corporate Responsibility and Executive Liability", Canadian Law Book Inc. 1990;

SESSION 2

PCBs: DESTRUCTION AND TRANSPORTATION REQUIREMENTS

Moderator: Dale Cameron, Manager, Ottawa District Office
Environmental Protection, Ontario Region
Environment Canada

STORAGE OF PCB WASTES INTERIM ORDER

Marcel de Bellefeuille, Environmental Officer
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Interim Order

Respecting the Storage

# of Wastes Containing PCBs

On September 22, 1988, subsequent to the PCB Fire at St. Basile-le-Grand, the Minister of the Environment issued an Interim Order Respecting the Storage Of Wastes Containing Chlorobiphenyls (PCBs),under Section 35 of the Canadian Environmental Protection Act (CEPA).

The purpose of the Interim Order was to ensure that PCBs were stored in a manner and under conditions which do not pose any threat to the environment or to human life or health.

On September 17, 1990, this Interim Order was to expire without having Regulations in place aimed at replacing it.

Because it was believed that immediate action was required to deal with this continuing threat to the environment or to human life or health pending the coming into force of the regulations, the Minister of the Environment issued a new Interim Order, identical to the first one. This Order became effective September 18, 1990 for a period of 2 years, or until regulations are in place.

This afternoon, I will atempt to go through each section of the Order and also show you some slides of PCB storage sites, that will illustrate several of the requirements of the Order.

INTERIM ORDER RESPECTING THE STORAGE OF WASTES CONTAINING CHLOROBIPHENYLS

(PCBs)

Storage of PCB Wastes Interim Order
Sections

Sections of the Order

1. Short Title
2. Definitions
3. Application of the Order
4. Owner/Operator Responsibilities
5. Access to Site
6. Storage Site Operational Requirements
7. Fire Protection & Emergency Procedures
8. Maintenance & Inspection
9. Labelling Requirements
10. Maintenance of Records
11. Reporting Requirements

INTERIM ORDER RESPECTING THE STORAGE OF WASTES CONTAINING CHLOROBIPHENYLS (PCBs)

Section 1

This Order may be cited as the:

■ Storage of PCB Wastes Interim Order ■

Storage of PCB Wastes Interim Order
Section 2

Definitions

- Chlorobiphenyls or PCBs means:
  - chlorobiphenyls with the number of Chlorine >2
- PCB Wastes means:
  - Equipment containing concentrated PCBs (Askarel)
  - Equipment contaminated with PCBs >50 ppm
  - Liquids containing PCBs >50 ppm
  - Solids containing PCBs >50 ppm

  that have been taken out of service for the purpose of disposal.
- Storage Site means:
  - any location used to store PCB Wastes

Storage of PCB Wastes Interim Order
Section 3

This Order applies to:

- Federal Departments, boards, or agencies;
- Corporations set out in Schedule III of the FAA;
- Federal works or undertakings as defined in CEPA;

This Order does not apply to:

- Sites containing:
  - less than 1 Kg of PCBs
  - less than 100 Litres of PCB liquids
  - less than 100 Kg of PCB solids
- Private sites located in provinces listed in Schedule A
- Handling PCB wastes under TDGA

Storage of PCB Wastes Interim Order
Section 4

Owners or Operators Responsibilities

- Owners or operators of PCB waste sites:
  - must store PCB wastes in accordance with the requirements & conditions set out in this Order.

- Owners of PCB wastes stored by some other person:
  - must exercise due diligence to ensure that the wastes are stored in accordance with the requirements and conditions set out in this Order.

Storage of PCB Wastes Interim Order
Section 5

Access to PCB Storage Site

- Owners and operators of PCB waste sites shall:
  - ensure that only authorized personnel have access;
  - ensure that all PCB wastes are stored inside:
    - a locked room, building, other structure, or
    - a fenced or wall 2 m high in open areas, or
    - a fence or wall 1.83 m (6 ft.) high if site existed before this Order came into effect;
  - maintain a registry of authorized personnel and their employers;
- A person may only enter if that person is authorized

Storage of PCB Wastes Interim Order
Section 6

PCB Storage Site Floors & Curbs

- Owners and operators of PCB waste sites shall ensure:
  - that the floor be impervious to PCBs;
  - that the area have a curb that can contain:
    - twice the volume of largest item, or
    - 25 % of the total volume;
  - that the floor and curb capable of absorbing PCBs:
    - be sealed with durable PCB resistant coating;
  - that drains, sumps, other openings be closed & sealed.

Storage of PCB Wastes Interim Order
Section 6

Indoor PCB Storage Site

- Indoor storage sites must have a mechanical exhaust system:
  - unoccupied building:
    - with heat & smoke sensory controls to stop fan to stop fan & close exhaust/intake dampers.
  - occupied building:
    - with heat & smoke sensory controls to close exhaust dampers that vent into the building.

Storage of PCB Wastes Interim Order
Section 6

Outdoor PCB Storage Site

- Equipment containing PCB liquids or PCB liquids:
  - must be equipped with a weatherproof roof or barrier that also protects the curbing or sides of floor.
- Equipment drained or drained containers:
  - must be structurally sound and weatherproof.
- Drums or containers of PCB solids and light ballasts:
  - must be made of steel or other metals to prevent
    - ■ release into the environment;
    - ■ being affected by the weather;
    - ■ being contaminated by external sources
  - must be structurally sound and weatherproof.

Storage of PCB Wastes Interim Order
Section 6

Outdoor PCB Storage Site

- PCB Liquids shall be stored in:
  - drums or sealed containers made of steel or other metals to prevent:
    - release into the environment;
    - being affected by weather, and
    - being contaminated by external sources.

Storage of PCB Wastes Interim Order
Section 6

Drums used to store PCB wastes

- PCB Liquids shall be:
  - not greater than 205 litres (45 gal);
  - made of 16 gauge steel or heavier;
  - double bung;
  - painted to prevent rusting.
- PCB Solids shall be:
  - not greater than 205 litres (45 gal);
  - made of 18 gauge steel or heavier;
  - equipped with a securely attached, removable steel lid and a PCB resistant gasket,
  - painted to prevent rusting.

Storage of PCB Wastes Interim Order
Section 6

Drums, Containers and Equipment Stacking & Placing

- Drums or other portable containers and equipment:
  - shall be placed on skids or pallets;
- Drums containing PCB wastes that are stacked:
  - must be separated by pallets;
  - no more than 2 containers high if containing liquids.
- Drums containing PCB wastes must be:
  - placed to allow them to be inspected;
  - stored as to avoid contaminating other materials during a fire, leak, spill or other discharge.

Storage of PCB Wastes Interim Order
Section 6

PCB Waste Segregation

- PCB wastes must be:
  - stored seperately from other substances, equipment or material;
  - separated from flammable materials:
    - by a fire resistant barrier, or
    - enough space to reduce risk of combustion

Storage of PCB Wastes Interim Order
Section 7

Fire Protection and Emergency Procedures

- Every owner and operator of PCB waste sites shall:
    - develop in consultation with the local fire department a fire control & emergency plan;
    - have this plan posted at the site;
    - have clean-up material on site.
- Every site located inside a building shall have:
    - the above;
    - a fully operative fire alarm system;
    - and portable or flood type fire extinguishers.

Storage of PCB Wastes Interim Order
Section 8

Maintenance and Inspection

- Every owner and operator of PCB waste sites shall:
    - know and understand current PCB waste management procedures;
    - know the use of personnel protection equipment;
    - know the clean-up techniques in the event of a spill;
- Every owner and operator shall:
    - inspect monthly the storage site, including PCB equipment, floors, fire prevention equipment etc.;
    - repair or replace immediately any defects;
    - immediately repair or replace any drum, container or equipment leaking PCBs and clean up contaminated area

Storage of PCB Wastes Interim Order
Section 9

Labelling Requirements

- Entrances to PCB storage sites, fencing and barriers:
  - must have the E-C 150 X 150 mm NON-SERIALIZED B & W label or another label of similiar dimensions indicating presence of PCBs.

Storage of PCB Wastes Interim Order
Section 9

Labelling Requirements

- Capacitors containing 0.5 kg or more of PCBS:
  - must have the E-C 78 X 78 mm SERIALIZED B & W label or another serialized label of similar dimensions unless capacitors were in storage before this Order came in effect.

- Transformers or other equipment containing >10,000 ppm:
  - must have the E-C 150 X 150 mm SERIALIZED B & W label or another serialized label of similiar dimensions indicating presence of PCBs.

Storage of PCB Wastes Interim Order
Section 9

Labelling Requirements

- Containers that contain or contained PCBs >10,000 ppm:
  - must have the E-C 150 X 150 mm NON-SERIALIZED B & W label or another label of similiar dimensions indicating presence of PCBs.

- Electrical equipment containing >50 ppm but <10,000 ppm:
  - must have the E-C 150 X 150 mm NON-SERIALIZED Green label "ATTENTION-Contaminated with PCBs" or another label of similar dimensions indicating PCBs.

Storage of PCB Wastes Interim Order
Section 10

Maintenance of Records

- Owners or operators of PCB storage sites shall maintain:
  - an inventory of each item of PCB waste and the quantity of PCBs contained on the effective date of this Order;
  - an inventory of each item received or removed after the effective date of this Order
  - a record of monthly inspections of the storage site, the contents and any spills and clean-up activities
  - have the inventory, the monthly inspection records, books and records available for review by inspectors

PCB Wastes Interim Order
Section 10

Maintenance of Records

- New PCB wastes received must be recorded in the PCB Inventory as follows:
  - Date received
  - Description of wastes (serial #s, registration #s)
  - Quantity
  - Physical condition (poor, good, rusted, etc.)
  - Source of the waste (location, generator, etc.)
  - Name of carrier
  - Name of person accepting the wastes

Applies to all PCB storage sites (old & new)

PCB Wastes Interim Order
Section 10

Maintenance of Records

- PCB wastes removed or decontaminated must be recorded in the Inventory as follows:
  - Date of removal / decontamination
  - Description of wastes (type, serial #s, E-C #s)
  - Quantity
  - Physical condition (poor, good, rusted, etc.)
  - Destination of the PCB waste
  - Name of carrier of the PCB waste
  - Name of person authorizing the transportation of PCB wastes

Applies to all PCB storage sites (old & new)

Storage of PCB Wastes Interim Order

Section 11

Reporting Requirements

- New storage site owners or operators shall submit to E-C within 30 days:
    - a copy of the inventory of each item of PCB waste;
    - the quantity of PCBs stored at the site.
- Existing site owners or operators shall submit to E-C:
    - copies of the records when PCB wastes were received or removed from the storage site;
    - on January 1 for the periods July 2 - December 31
    - on July 1 for the period January 2 - June 30
- Reporting is NOT required if there have been no changes.

Storage of PCB Wastes Interim Order

Penalties for Non-Compliance

- Under CEPA Section 113 paragraph (i), every person who fails to comply with the Order made under section 35 is liable:
  - on summary conviction, to a fine not exceeding $300,000 or to imprisonment for a term of not exceeding 6 months, or both, or
  - on indictment, to a fine not exceeding $1,000,000 or to imprisonment for a term of not exceeding 3 years, or to both.

REGULATIONS REGARDING PCB DESTRUCTION

John Hilborn, Research Manager, PCB Technology Division
Conservation and Protection, Environment Canada

FEDERAL PCB
DESTRUCTION PROGRAM

ORIGINAL GOAL (1988)

- To phase-out all in-use PCBs by 1993:
- - Contingent on the establishment of a broadly-based waste management program in Canada; and
- - The availability of destruction facilities

COMMITMENT (1988)

- Siting of a second PCB incinerator (after Goose Bay) in central Canada

UPDATED COMMITMENT (1989)

- Siting of mobile destruction facilities in regions across Canada with sufficient volumes of PCB wastes, and requiring federal assistance

GREEN PLAN GOAL

- By 1996, destroy all PCBs under federal jurisdiction and establishing mobile incinerators in Atlantic Canada, Quebec and Ontario

FEDERAL PCB
REGULATIONS

- CHLOROBIPHENYL REGULATIONS
  - December 15, 1990
  - Canada Gazette, Part I
- STORAGE OF PCB WASTES INTERIM ORDER
  - October 13, 1990
  - Canada Gazette, Part I
- PCB WASTE EXPORT REGULATIONS
  - August 15, 1990
  - Canada Gazette, Part II
- FEDERAL MOBIL PCB TREATMENT AND DESTRUCTION REGULATIONS
  - January 3, 1990
  - Canada Gazette, Part II
- TRANSPORT OF PCBs GOVERNED BY TRANSPORTATION OF DANGEROUS GOODS REGULATIONS

FEDERAL MOBILE PCB TREATMENT AND DESTRUCTION REGULATIONS

- Canada Gazette, Part I, August 5, 1989
- Canada Gazette, Part II, January 3, 1990
- Applicability - federal lands, federal contracts
- Operator to demonstrate that system meets standards before authorization given
- Written permission to conduct tests
- Conduct tests at minister's request
- Specified test methods

STANDARDS FOR PCB TREATMENT AND DESTRUCTION SYSTEMS

APPLICATION	SYSTEM	STANDARD
GAS	DESTRUCTION	1 mg/kg PCBs
OIL	TREATMENT	2 mg/kg PCBs
GAS	BOTH	50 mg/Nm^3 Particulate 75 mg/Nm^3 Hydrogen Chloride 12 ng/Nm^3 PCDDs and PCDFs
LIQUID	DESTRUCTION	5 mg/L PCBs 0.6 ng/L PCDDs and PCDFs
SOLID	BOTH	0.5 mg/kg PCBs 1 ug/kg PCDDs and PCDFs

Note: The concentrations of PCDDs and PCDFs are determined using toxicity factors

TEST METHODS FOR COMPLIANCE WITH PCB REGULATIONS

RELEASE OF GASES INTO ENVIRONMENT

- Particulate matter (EPS 1-AP-74-1)
- Hydrogen Chloride (EPS 1/RM/1)
- PCBs, Dioxins and Furans
  Sampling (EPS 1/RM/2)
  Analysis (EPS 1/RM/3)

RELEASE OF SOLIDS AND LIQUIDS ENVIRONMENT WHILE GAS SAMP ONGOING

- Sample every 15 min
- Take a representative sample
- Analyze using EPS 1/RM/3

AUTHORIZATION TO OPERATE A TREATMENT OR DESTRUCTION SYSTEM

MAY DEFINE

- Where the system will operate
- When the system will operate
- Which wastes will be handled
- How long the system will operate
- Reporting requirements
- Withdrawl of authorization
- Notification of Environment Canada

THE CONTRACT TO MANAGE PCB WASTES

- Between proponent and system operator
- Defines roles and responsibilities
- Preparation of Waste
- Compliance testing
- Quality assurance - control
- Costs
- Scheduling
- Analysis of residues
- Disposal of residues
- Environmental assessment

CEPA INSPECTORS CONCERNS

- Stack testing process
- Violations/inspectors directives
- Solids and liquids removal
- Audit samples
- Emergency shut - downs
- Validity of data
- Interpretation of standards
- Operating parameters
- Inventory

PHYSICAL/CHEMICAL AND INCINERATION TECHNIQUES FOR PCB DESTRUCTION

Dave Campbell, Head, Control Section
Hazardous Waste Management Division, Conservation and Protection
Environment Canada

PCB DESTRUCTION TECHNOLOGIES

BEFORE DISCUSSING PCB TREATMENT AND DESTRUCTION TECHNOLOGIES, I WOULD FIRST LIKE TO BRIEFLY SUMMARIZE THE TYPES AND THE QUANTITIES OF PCB WASTES THAT HAVE TO BE TREATED BY THESE TECHNOLOGIES.

V1

AS SHOWN ON THIS OVERHEAD, THESE WASTES INCLUDE HIGH CONCENTRATION PCB LI1QUIDS, OR ASKARELS, WHICH ARE USED AS DIELECTRIC FLUIDS IN ELECTRICAL TRANSFORMERS. THE PCB CONCENTRATION OF ASKARELS IS USUALLY BETWEEN 50-70%.

THERE ARE ALSO LOW CONCENTRATIONS OF PCBS IN PCB-CONTAMINATED MINERAL OIL, ALSO FROM TRANSFORMERS. IN THIS CASE THE PCB CONCENTRATION IS NEARLY ALWAYS LESS THAN 1 000 PPM AND USUALLY LESS THAN 500 PPM.

ANOTHER TYPE OF PCB WASTE IS THE CASINGS AND INTERNALS FROM ELECTRICAL EQUIPMENT THAT HAD CONTAINED PCBS. A SIMILAR KIND OF WASTE IS THE CONTAINERS IN WHICH PCB WASTES WERE STORED.

FOR EXAMPLE, AT THE DEPT. OF NATIONAL DEFENCE BASE AT GOOSE BAY, LABRADOR, THERE ARE OVER 6000 45-GALLON DRUMS WHICH WERE USED TO STORE PCB WASTE AND WHICH REQUIRE TREATMENT.

THERE ARE ALSO VARIOUS KINDS OF PCB-CONTAMINATED SOLIDS AND SLUDGES. THE PCB CONCENTRATION OF THESE MATERIALS CAN RANGE UP TO MANY THOUSANDS OF PARTS PER MILLION.

V2

THIS IS A SUMMARY OF THE NATIONAL PCB WASTE INVENTORY, AND GIVES THE QUANTITIES OF PCB WASTES IN VARIOUS CATEGORIES.

THERE ARE ABOUT 28 000 TONNES OF ASKARELS, IN BULK STORAGE AND IN TRANSFORMERS AND CAPACITORS. THIS 28 000 TONNES INCLUDES THE WEIGHT OF THE TRANSFORMERS AND THE CAPACITORS.

LAMP BALLASTS REPRESENT A FURTHER 11 000 TONNES OF PCB WASTE.

SOLID WASTES, WHICH ARE MAINLY CONTAMINATED SOIL, ARE A MAJOR COMPONENT OF THE OVERALL WASTE INVENTORY AND REPRESENT ABOUT TWO THIRDS OF THE TOTAL.

THERE ARE ALSO ABOUT 8 000 TONNES OF PCB-CONTAMINATED MINERAL OIL.

CURRENTLY, THESE PCB WASTES ARE STORED AT OVER 3000 SECURE STORAGE SITES ACROSS CANADA. THE FEDERAL GOVERNMENT IS RESPONSIBLE FOR ABOUT 550 OF THESE SITES.

V3

IN GENERAL, PCB DESTRUCTION AND TREATMENT TECHNOLOGIES CAN BE CLASSIFIED INTO THE GROUPS SHOWN.

THERMAL DESTRUCTION TECHNOLOGIES USUALLY INVOLVE HIGH TEMPERATURE OXIDATION, IN OTHER WORDS INCINERATION. INCINERATION IS VERY WIDELY USED FOR THE DESTRUCTION OF HAZARDOUS WASTES, INCLUDING ALL TYPES OF PCB WASTES. THERE ARE VARIOUS TYPES OF INCINERATION SYSTEMS; THESE INCLUDE ROTARY KILN INCINERATORS, LIQUID INJECTION INCINERATORS, AND CIRCULATING FLUIDIZED BED INCINERATORS.

AT PRESENT, THE WORKHORSE IN THE PCB INCINERATION FIELD IS THE ROTARY KILN INCINERATOR. THIS IS A VERSATILE SYSTEM WHICH CAN BE USED TO INCINERATE SOLIDS, LIQUIDS, SLUDGES AND GASES.

ESSENTIALLY, THE ROTARY KILN INCINERATOR CONSISTS OF A WASTE PREPARATION AND FEED SYSTEM, A ROTARY KILN PRIMARY COMBUSTION CHAMBER, A SECONDARY COMBUSTION CHAMBER, AND AN AIR POLLUTION CONTROL SYSTEM FOR THE REMOVAL OF PARTICULATES AND ACID GASES, SUCH AS HCl, FROM THE FLUE GASES.

THERE ARE ALSO SEVERAL OTHER KINDS OF THERMAL PCB DESTRUCTION TECHNOLOGIES; THESE INCLUDE THE PLASMA ARC SYSTEM, MOLTEN BED CHEMICAL REACTORS, CEMENT KILNS, AND THE HIGH-TEMPERATURE REDUCTION OF PCBS USING HYDROGEN.

THERE ARE LIMITATIONS TO SOME OF THESE OTHER TECHNOLOGIES. FOR EXAMPLE, ONLY PUMPABLE LIQUIDS CAN BE TREATED WITH THE PLASMA ARC SYSTEM, WHILE CEMENT KILNS ARE ONLY APPLICABLE TO WASTES THAT HAVE A SUITABLE HEATING VALUE. THUS, NEITHER THE PLASMA ARC SYSTEM NOR CEMENT KILNS WOULD BE USED FOR THE TREATMENT OF PCB-CONTAMINATED SOIL.

CHEMICAL DECHLORINATION PROCESSES HAVE BEEN IN ROUTINE USE FOR A NUMBER OF YEARS FOR THE TREATMENT OF PCB-CONTAMINATED MINERAL OIL CONTAINING UP TO ABOUT ONE PERCENT OF PCBS. FOUR COMPANIES IN CANADA OFFER THIS SERVICE ON A COMMERCIAL BASIS. IN ADDITION, SOME ELECTRICAL UTILITY COMPANIES IN CANADA ALSO OPERATE THEIR OWN IN-HOUSE OIL-DECONTAMINATION SYSTEMS.

DECHLORINATION IS USUALLY DONE ON-SITE, USING MOBILE EQUIPMENT. DEPENDING ON THE PARTICULAR DECHLORINATION PROCESS, AND THE REQUIREMENTS OF THE CLIENT, THE DECONTAMINATED MINERAL OIL CAN BE UPGRADED TO TRANSFORMER QUALITY AND REUSED.

A CHEMICAL DECHLORINATION METHOD, CALLED KPEG, IS ALSO BEING USED TO TREAT PCB-CONTAMINATED SOIL AND MAY OFFER A LOWER COST APPROACH TO PCB DESTRUCTION THAN INCINERATION OF THE SOIL. THE PROCESS USES POTASSIUM HYDROXIDE AND POLYETHYLENE GLYCOL AS THE ACTIVE REAGENTS; HENCE THE ACRONYM, KPEG. IN ONE PATENTED VERSION OF THIS TECHNIQUE, DIMETHYL SULFOXIDE IS ADDED AS A CO-SOLVENT TO INCREASE

THE SPEED OF THE REACTION. IN THE OPERATION OF THE KPEG PROCESS, THE SOIL AND REAGENTS ARE MIXED TO FORM A SLURRY, WHICH IS THEN HEATED AND ALLOWED TO REACT UNTIL THE PCB CONCENTRATION HAS REACHED AN ACCEPTABLE LEVEL. THE SOIL AND REAGENTS ARE THEN SEPARATED AND THE RECOVERED REAGENTS RECYCLED.

RECENTLY, SOME COMPANIES (E.G., SANEXEN/EXTRAKSOL; NUS CORP; RESOURCE CONSERVATION CO./B.E.S.T., ENSR) HAVE DEVELOPED SOLVENT EXTRACTION PROCESSES WHICH CAN BE USED TO REMOVE PCBS FROM SOLID WASTES, SUCH AS CONTAMINATED SOIL. THE SOLVENTS USED INCLUDE METHANOL AND TRIETHYLAMINE.

SOLVENT EXTRACTION IS NOT A PCB DESTRUCTION PROCESS, BUT RATHER A TREATMENT PROCEDURE WHICH REMOVES PCBS FROM THE WASTE OF CONCERN. THE SOLVENT WASH SOLUTION, WHICH CONTAINS PCBS, REQUIRES FURTHER TREATMENT BY CHEMICAL OR THERMAL MEANS TO FINALLY DESTROY THE PCBS.

A SIMILAR SITUATION APPLIES TO THERMAL DESORPTION PROCESSES (TACIUK, ASWTC, DEKONTA). IN THIS TYPE OF PROCESS, PCB-CONTAINING SOLID WASTES ARE HEATED UNDER OXYGEN-FREE CONDITIONS. THE PCBS ARE VOLATILIZED AND THEN EITHER ROUTED TO AN INCINERATOR FOR DESTRUCTION, OR CONDENSED AND RECOVERED. IF THE PCBS ARE RECOVERED, HERE AGAIN A FURTHER DESTRUCTION STEP WILL BE REQUIRED.

THERMAL DESTRUCTION

I WOULD NOW LIKE TO LOOK IN MORE DETAIL AT INCINERATION SYSTEMS. THESE VARY QUITE WIDELY IN SIZE AND CAPACITY, BUT CAN BE DIVIDED INTO THREE TYPES; THESE ARE

STATIONARY,
TRANSPORTABLE, AND
MOBILE INCINERATORS.

STATIONARY INCINERATORS ARE PERMANENT INSTALLATIONS AND HAVE THE LARGEST CAPACITY OF THE THREE TYPES. THEY BENEFIT FROM ECONOMY OF SCALE AND HAVE THE LOWEST COST FOR THE DESTRUCTION OF PCBS. THEY DO HAVE THE DISADVANTAGE THAT THE PCB WASTES MUST BE TRANSPORTED, PERHAPS OVER LONG DISTANCES, TO THE INCINERATOR, WITH THE ATTENDANT RISK OF ACCIDENTS.

IN THE UNITED STATES, THERE ARE FOUR COMPANIES (ROLLINS, ENSCO, SCA, APTUS) THAT OPERATE STATIONARY PCB INCINERATION SYSTEMS. IN ALL CASES, THEY USE HIGH-TEMPERATURE ROTARY KILN SYSTEMS.

ALTHOUGH THESE COMPANIES ACCEPT ALL FORMS OF PCB WASTE FROM ANY LOCATION IN THE UNITED STATES, THEY DO NOT ACCEPT ANY PCB WASTES FROM CANADA. THIS IS BECAUSE, BY UNITED STATES LAW, THE UNITED STATES/CANADA BORDER IS CLOSED TO THE IMPORT OF PCB WASTES FROM CANADA.

IN EUROPE, THERE ARE ALSO A NUMBER OF COMMERCIAL INCINERATORS THAT

ARE USED TO DESTROY PCBS. TREDI IN FRANCE AND RECHEM IN ENGLAND ARE TWO EXAMPLES.

IN CANADA, THERE IS ONLY ONE STATIONARY INCINERATION SYSTEM THAT CAN BE USED FOR PCB DESTRUCTION. THIS INCINERATOR IS AT THE ALBERTA SPECIAL WASTE TREATMENT CENTRE AT SWAN HILLS, ALBERTA. AT PRESENT, ONLY PCBS FROM THE PROVINCE OF ALBERTA MAY BE SENT TO SWAN HILLS.

V4

THIS IS AN ISOMETRIC VIEW OF THE INCINERATION SYSTEM AT SWAN HILLS. IT HAS TWO IDENTICAL INCINERATOR TRAINS. EACH TRAIN CONSISTS OF A VON ROLL ROCKING KILN AND A SECONDARY COMBUSTION CHAMBER. A COMMON AIR POLLUTION CONTROL SYSTEM IS USED FOR BOTH TRAINS.

V5

THIS DIAGRAM SHOWS THE INCINERATION UNITS IN MORE DETAIL, WITH THE TWO HORIZONTAL KILNS AND THE VERTICAL SECONDARY COMBUSTION CHAMBERS. YOU WILL NOTICE THAT THERE IS AN EMERGENCY VENT STACK FOLLOWING THE SECONDARY COMBUSTION CHAMBERS.

THE KILNS THEMSELVES ARE OF A SOMEWHAT UNUSUAL DESIGN IN THAT THEY ROTATE ONLY THROUGH 90 DEGREES, 45 DEGREES EACH SIDE OF CENTRE. SLAG IS PERIODICALLY WITHDRAWN FROM THE KILNS BY ROTATING THEM THROUGH 180 DEGREES.

V6

SINCE IT WAS LICENSED TO OPERATE IN LATE 1988, THE INCINERATOR AT SWAN HILLS HAS DESTROYED ALMOST 4000 TONNES OF PCB WASTES. THE BULK OF THESE WASTES WERE PCB LIQUIDS.

ALTHOUGH THE VON ROLL INCINERATOR CAN BE USED FOR SOLID AND LIQUID WASTES, IT HAS BEEN FOUND TO BE MORE SUITABLE FOR THE TREATMENT OF LIQUIDS.

IN ORDER TO BETTER HANDLE SOLIDS AT SWAN HILLS, A NEW INCINERATOR HAS BEEN INSTALLED. THIS IS A CONVENTIONAL ROTARY KILN SYSTEM, WHICH IS NOW UNDERGOING COMPLIANCE TESTING. DEPENDING ON THE HEAT CONTENT OF THE WASTE, THIS SYSTEM CAN INCINERATE UP TO ABOUT 15 000 TONNES/YEAR OF SOLIDS.

IN ONTARIO, A STATIONARY ROTARY KILN INCINERATOR IS PLANNED FOR THE ONTARIO WASTE MANAGEMENT CORPORATION'S INTEGRATED WASTE TREATMENT FACILITY IN LINCOLN COUNTY. PUBLIC HEARINGS ARE UNDERWAY AT THE MOMENT WITH RESPECT TO THE SITING OF THIS FACILITY. THESE HEARINGS ARE EXPECTED TO CONTINUE FOR PERHAPS ANOTHER 18 MONTHS, SO, AT THE BEST, IT WILL BE SOME TIME BEFORE A STATIONARY INCINERATOR IS OPERATING IN ONTARIO.

IN OTHER DEVELOPMENTS, AN MEMORANDUM OF UNDERSTANDING HAS BEEN PREPARED FOR SIGNATURE BY THE FEDERAL GOVERNMENT AND THE ATLANTIC PROVINCES FOR THE ESTABLISHMENT OF AN ATLANTIC-REGION PCB DESTRUCTION FACILITY, WHILE EARLIER THIS YEAR THE WESTERN CANADA ENVIRONMENT MINISTERS WERE INSTRUCTED BY THEIR PREMIERS TO "ASSESS THE EXTENT TO WHICH THE EFECTIVE MANAGEMENT OF HAZARDOUS WASTES NEEDS TO BE CONDUCTED ON A REGIONAL BASIS IN WESTERN CANADA" - THIS INSTRUCTION PRESUMABLY INCLUDES THE NEED FOR REGIONAL INCINERATION.

TRANSPORTABLE/MOBILE INCINERATORS

AS DISTINCT FROM STATIONARY SYSTEMS, TRANSPORTABLE AND MOBILE INCINERATION SYSTEMS ARE DESIGNED TO BE TAKEN TO THE SITE OF THE WASTE, ASSEMBLED, AND THEN, AFTER THE WASTE HAS BEEN DESTROYED, DISMANTLED AND MOVED OUT. OPINION POLLS HAVE INDICATED THAT THESE SYSTEMS ARE MUCH MORE ATTRACTIVE TO THE GENERAL PUBLIC THAN STATIONARY OR PERMANENT INCINERATORS.

THE DIFFERENCE BETWEEN TRANSPORTABLE AND MOBILE SYSTEMS IS A MATTER OF SIZE. TRANSPORTABLE UNITS ARE REASONABLY LARGE AND REQUIRE A NUMBER OF WEEKS BOTH TO ASSEMBLE AND TO DISMANTLE. AS A RESULT, THEY REQUIRE A MINIMUM QUANTITY OF WASTE, USUALLY BETWEEN 5 000 AND 10 000 TONNES, TO ALLOW THEM TO BE USED ECONOMICALLY AT A GIVEN SITE. TYPICALLY THEY WILL PROCESS ABOUT FIVE TONNES PER HOUR OF WASTE.

MOBILE UNITS, ON THE OTHER HAND, ARE RELATIVELY SMALL AND CAN BE SET UP AND OPERATING WITHIN A FEW DAYS OF ARRIVING AT A SITE. THEIR PRINCIPAL ADVANTAGE IS THAT THEY CAN BE USED ECONOMICALLY TO DEAL WITH LESS THAN A THOUSAND TONNES OF WASTE. THEY PROCESS ABOUT ONE TONNE PER HOUR OF WASTE.

BECAUSE PCB WASTES ARE WIDELY DISPERSED ACROSS CANADA, TRANSPORTABLE AND MOBILE INCINERATION SYSTEMS ARE POTENTIALLY VERY ATTRACTIVE FROM THE CANADIAN PCB DESTRUCTION VIEWPOINT.

I WOULD THEREFORE LIKE TO SPEND A LITTLE TIME TO DESCRIBE THE KIND OF REGULATORY REQUIREMENTS THAT THEY WILL HAVE TO MEET.

ONE OF THESE REQUIREMENTS IS TERMED "DESTRUCTION AND REMOVAL EFFICIENCY", OR **DRE**. **DRE** IS A PERFORMANCE-BASED CRITERION WHICH IS USED INTERNATIONALLY TO ASSESS THE ABILITY OF AN INCINERATOR TO DESTROY PCBS.

V7

AS WILL BE SEEN FROM THIS SCHEMATIC, DRE IS DEFINED AS THE AMOUNT OF PCBS ENTERING THE INCINERATOR MINUS THE AMOUNT OF PCBS EMITTED IN THE STACK GASES, DIVIDED BY THE AMOUNT OF PCBS ENTERING THE INCINERATOR. DRE IS **NOT** RELATED TO THE AMOUNT OF PCBS THAT MAY BE

CONTAINED IN THE ASH OR SCRUBBER WATER DISCHARGED FROM THE INCINERATOR.

A MINIMUM DRE OF 99.9999%, OR SIX "NINES" AS IT IS USUALLY KNOWN, IS REQUIRED FOR PCB INCINERATORS.

V8

THIS OVERHEAD SHOWS THE FEDERAL REGULATIONS FOR THE OPERATION OF TRANSPORTABLE AND MOBILE PCB DESTRUCTION SYSTEMS. THESE REGULATIONS CAME INTO FORCE IN JANUARY OF THIS YEAR. DRE IS NOT SPECIFICALLY MENTIONED; HOWEVER, AN AIR EMISSION OF 1 MG OF PCBS PER KG OF PCB INPUT TO THE INCINERATOR IS EQUIVALENT TO A DRE OF SIX 'NINES'. THE REGULATION ALSO COVERS THE AIR EMISSIONS OF PARTICULATE MATTER, HCl, AND DIOXINS AND FURANS, AS WELL AS THE CONCENTRATION OF PCBS AND DIOXINS AND FURANS IN THE SOLID AND LIQUID DISCHARGES FROM THE INCINERATOR.

THE REGULATORY REQUIREMENTS FOR THE EMISSIONS OF DIOXINS AND FURANS ARE GIVEN IN TERMS OF 2,3,7,8-TCDD TOXIC EQUIVALENT VALUES, AND NOT IN TERMS OF TOTAL DIOXIN AND FURAN EMISSIONS AS IS DONE IN SOME OTHER JURISDICTIONS.

THIS MEANS THAT ONLY THOSE DIOXIN AND FURAN CONGENERS THAT HAVE CHLORINE ATOMS AT THE 2,3,7,8 POSITIONS OF THE PARENT MOLECULE ARE REGULATED.

V9

IN THE CASE OF DIOXINS, THERE ARE 75 POSSIBLE CHLORINATED DIOXIN CONGENERS. HOWEVER, ONLY THE SEVEN LISTED HERE, ALL OF WHICH HAVE CHLORINE ATOMS SUBSTITUTED AT THE 2,3,7,8 POSITIONS, ARE OF CONCERN.

TO DERIVE THE TOXIC EQUIVALENT VALUE FOR DIOXIN EMISSIONS, THE CONCENTRATION OF EACH OF THE 2,3,7,8-SUBSTITUTED CONGENERS IS MULTIPLIED BY THE TOXICITY FACTOR IN THE RIGHT-HAND COLUMN OF THE TABLE AND THE PRODUCTS SUMMED.

A SIMILAR SITUATION APPLIES TO FURAN EMISSIONS. IN THIS CASE THERE ARE TEN 2,3,7,8-SUBSTITUTED CONGENERS OF INTEREST OUT OF A TOTAL OF 135 MEMBERS OF THE CHLORINATED FURAN FAMILY.

OF THE PROVINCES, NEWFOUNDLAND AND ONTARIO HAVE ALSO PASSED REGULATIONS FOR THE OPERATION OF MOBILE PCB DESTRUCTION SYSTEMS.

V10

THIS IS A LIST OF SOME TRANSPORTABLE AND MOBILE INCINERATORS, WHICH HAVE BEEN DEVELOPED IN THE UNITED STATES, AND WHICH COULD BE APPLICABLE IN CANADA. WITH THE EXCEPTION OF THE VESTA MOBILE SYSTEM, ALL THESE INCINERATORS HAVE A TSCA LICENCE IN THE UNITED

STATES TO DESTROY PCBS .

IT SHOULD BE NOTED THAT THE MAXIMUM DESIGN THROUGHPUT GIVEN IN THE THIRD COLUMN OF THIS TABLE IS NOT NECESSARILY THE THROUGHPUT FOR WHICH THE SYSTEM IS LICENSED TO DESTROY PCBS.

THE ENSCO MWP2000 TRANSPORTABLE INCINERATOR, WHICH IS THE FIRST ON THE LIST, RECEIVED APPROVAL LAST WEEK FROM THE ONTARIO MINISTRY OF THE ENVIRONMENT FOR THE DESTRUCTION OF ABOUT 8 000 TONNES OF PCB WASTES, WHICH ARE STORED AT SMITHVILLE IN SOUTH WESTERN ONTARIO. I GATHER THAT THERE ARE STILL SOME CONTRACTUAL MATTERS TO BE RESOLVED BETWEEN ENSCO AND THE ONTARIO GOVERNMENT BUT THAT THE UNIT SHOULD BE ON-SITE AT SMITHVILLE LATER THIS YEAR.

A PCB TEST PROGRAM HAS RECENTLY BEEN COMPLETED USING THE VESTA 100 MOBILE INCINERATOR. THIS PROGRAM WAS SPONSORED BY THE ONTARIO MINISTRY OF THE ENVIRONMENT, THE MINISTRY OF THE ENVIRONMENT OF QUEBEC, ONTARIO HYDRO, HYDRO QUEBEC, AND ENVIRONMENT CANADA.

THROUGH THE COOPERATION OF THE ALBERTA SPECIAL WASTE MANAGEMENT CORPORATION, THE TESTING WAS DONE AT THE ALBERTA SPECIAL WASTE TREATMENT CENTRE AT SWAN HILLS. THE TESTS INVOLVED PCB DESTRUCTION RUNS USING SOIL SPIKED WITH ABOUT 1% AND 10% ASKARELS. THE OBJECTIVE OF THE PROGRAM IS TO DETERMINE IF THE VESTA SYSTEM CAN MEET THE REGULATORY REQUIREMENTS OF THE SPONSORING AGENCIES. WE EXPECT TO HAVE THE TEST RESULTS BY THE END OF AUGUST.

THE FIRST FOUR INCINERATORS LISTED HERE - ENSCO, OH MATERIALS, ROY F. WESTON AND OGDEN - REPRESENT THREE DIFFERENT APPROACHES TO INCINERATOR DESIGN. THE ENSCO AND THE ROY F. WESTON SYSTEMS ARE CONVENTIONAL ROTARY KILN UNITS. THE OH MATERIALS INCINERATOR, ON THE OTHER HAND, DOES NOT EMPLOY A ROTARY KILN. INSTEAD, IT USES A WOVEN METAL CONVEYOR BELT TO TRANSPORT SOLID FEED IN THE PRIMARY INCINERATION CHAMBER. THIS CHAMBER IS HEATED USING INFRARED HEATERS. THE REMAINDER OF THE OH MATERIALS SYSTEM CONSISTS OF A SECONDARY COMBUSTION CHAMBER, HEATED WITH PROPANE OR FUEL OIL, AND AN AIR POLLUTION CONTROL SYSTEM.

V11

THE OGDEN SYSTEM IS MARKEDLY DIFFERENT THAN THE OTHER TWO TYPES OF INCINERATORS. IT IS A FLUIDIZED BED SYSTEM IN WHICH THE SOLID OR LIQUID WASTE IS INJECTED INTO A RECIRCULATING FLUIDIZED BED OF INERT PARTICLES. LIMESTONE IS ALSO ADDED TO THE FLUIDIZED BED FOR THE REMOVAL OF ACID GASES, SO A WET SCRUBBER IS NOT REQUIRED. PARTICULATES ARE REMOVED FROM THE STACK GASES USING A BAGHOUSE.

THE OGDEN SYSTEM OPERATES AT ABOUT 850 DEGREES CELSIUS AND ACHIEVES A DRE OF SIX "NINES" FOR PCBS WITHOUT AN AFTERBURNER. AN OGDEN UNIT IS CURRENTLY OPERATING IN ALASKA, TREATING ABOUT 85 000 TONS OF PCB-CONTAMINATED SOIL. THE OPERATING EXPERIENCE WITH THIS SYSTEM HAS BEEN GOOD, WITH HIGH ON-LINE AVAILABILITY. IT HAS BEEN

PROCESSING ABOUT 100 TONS OF SOIL PER DAY.

OGDEN ALSO HAVE A SMALL-SCALE VERSION OF THEIR FLUIDIZED BED SYSTEM. THIS SYSTEM HAS BEEN USED AS A TEST BED FOR VARIOUS WASTE FEEDS. IT HAS A CAPACITY OF ABOUT ONE TON PER HOUR AND HAS A NATIONAL EPA LICENSE TO TREAT SOILS CONTAINING UP TO 10 000 PPM OF PCBS. OGDEN SAY THAT THEY ARE PLANNING TO CONVERT THIS UNIT TO A MOBILE SYSTEM.

AN OH MATERIALS INCINERATOR IS BEING USED AT THE DEPT. OF NATIONAL DEFENCE BASE, GOOSE BAY FOR THE DESTRUCTION OF ABOUT 3500 TONNES OF PCB-CONTAINING WASTE. THIS PROJECT IS NOW NEARING COMPLETION.

V12

THESE DATA ARE THE AVERAGE OF THREE TEST RUNS DONE IN JANUARY ON THE OH MATERIALS INCINERATOR AT GOOSE BAY. THE FEDERAL REGULATORY REQUIREMENTS FOR THE OPERATION OF THE SYSTEM ARE GIVEN IN THE RIGHT-HAND COLUMN OF THE TABLE. YOU WILL SEE THAT THE INCINERATOR MET THESE REQUIREMENTS AND ALSO THOSE OF NEWFOUNDLAND, WHICH ARE SIMILAR TO THOSE OF THE FEDERAL GOVERNMENT.

IN THESE TESTS, THE AVERAGE PCB CONCENTRATION IN THE FEED WAS ABOUT 10 500 PPM AND THE FEED RATE WAS ABOUT 5 TONNES PER HOUR.

COSTS

THE QUESTION OF COSTS FOR THE DESTRUCTION OF PCB WASTES IS OBVIOUSLY VERY IMPORTANT AND IS VERY FREQUENTLY ASKED.

UNFORTUNATELY, IT IS NOT POSSIBLE TO PROVIDE AN UNAMBIGUOUS ANSWER TO THIS QUESTION, BECAUSE DESTRUCTION COSTS ARE VERY MUCH SITE-SPECIFIC.

THEY DEPEND, AMONG OTHER THINGS, ON THE TYPE, QUANTITY, LOCATION, AND PCB CONCENTRATION OF THE WASTES. HOWEVER, FOR INCINERATION PROCESSES, YOU MAY CONSIDER THEM TO BE IN THE RANGE OF $1 500 TO $3 500 PER TON.

FOR CHEMICAL DECHLORINATION SYSTEMS, SOMEWHAT SIMILAR SITE-SPECIFIC CONSIDERATIONS ALSO APPLY. IN THIS CASE, PROCESSING COSTS ARE IN THE RANGE OF $2 TO $5 PER LITRE.

SUMMARY

IN SUMMARY, AS FAR AS THE INCINERATION OF PCBS IS CONCERNED, THERE

ARE LARGE STATIONARY FACILITIES THAT CAN PROCESS UP TO 20 TONNES PER HOUR, TRANSPORTABLE SYSTEMS THAT TREAT UP TO ABOUT 5 TONNES PER HOUR, AND MOBILE SYSTEMS THAT CAN TREAT ABOUT ONE TONNE PER HOUR.

IN ADDITION, THERE ARE MOBILE CHEMICAL TREATMENT SYSTEMS WHICH ARE USED FOR THE DECONTAMINATION OF PCB-CONTAMINATED MINERAL OIL.

OTHER TYPES OF DESTRUCTION AND TREATMENT PROCESSES ARE IN VARIOUS STAGES OF DEVELOPMENT. SOME OF THESE PROCESSES MAY OFFER TECHNICAL AND ECONOMIC ADVANTAGES OVER EXISTING SYSTEMS, BUT THEIR PERFORMANCE REMAINS TO BE PROVED.

JULY, 1990 (hpd)

TYPICAL PCB WASTES

HIGH CONCENTRATION FLUIDS (ASKARELS) IN TRANSFORMERS

LOW CONCENTRATION PCB's IN PCB–CONTAMINATED MINERAL OIL

ELECTRICAL EQUIPMENT CASINGS, CORES, AND WINDINGS

CONTAINERS FOR PCB WASTE

PCB–CONTAMINATED SOILS, SLUDGES, AND MISCELLANEOUS SOLID WASTES

PCB WASTE INVENTORY; SUMMARY

WASTE	QUANTITY (GROSS, T)
1. ASKAREL	
BULK (IN DRUMS)	4 044
IN TRANSFORMERS (INCLUDING CASING & INTERNALS)	20 237
IN CAPACITORS	3 571
2. LAMP BALLASTS	11 330
3. OTHER SOLIDS (MAINLY SOIL)	104 719
4. CONTAMINATED MINERAL OIL	8 047
TOTAL	151 948

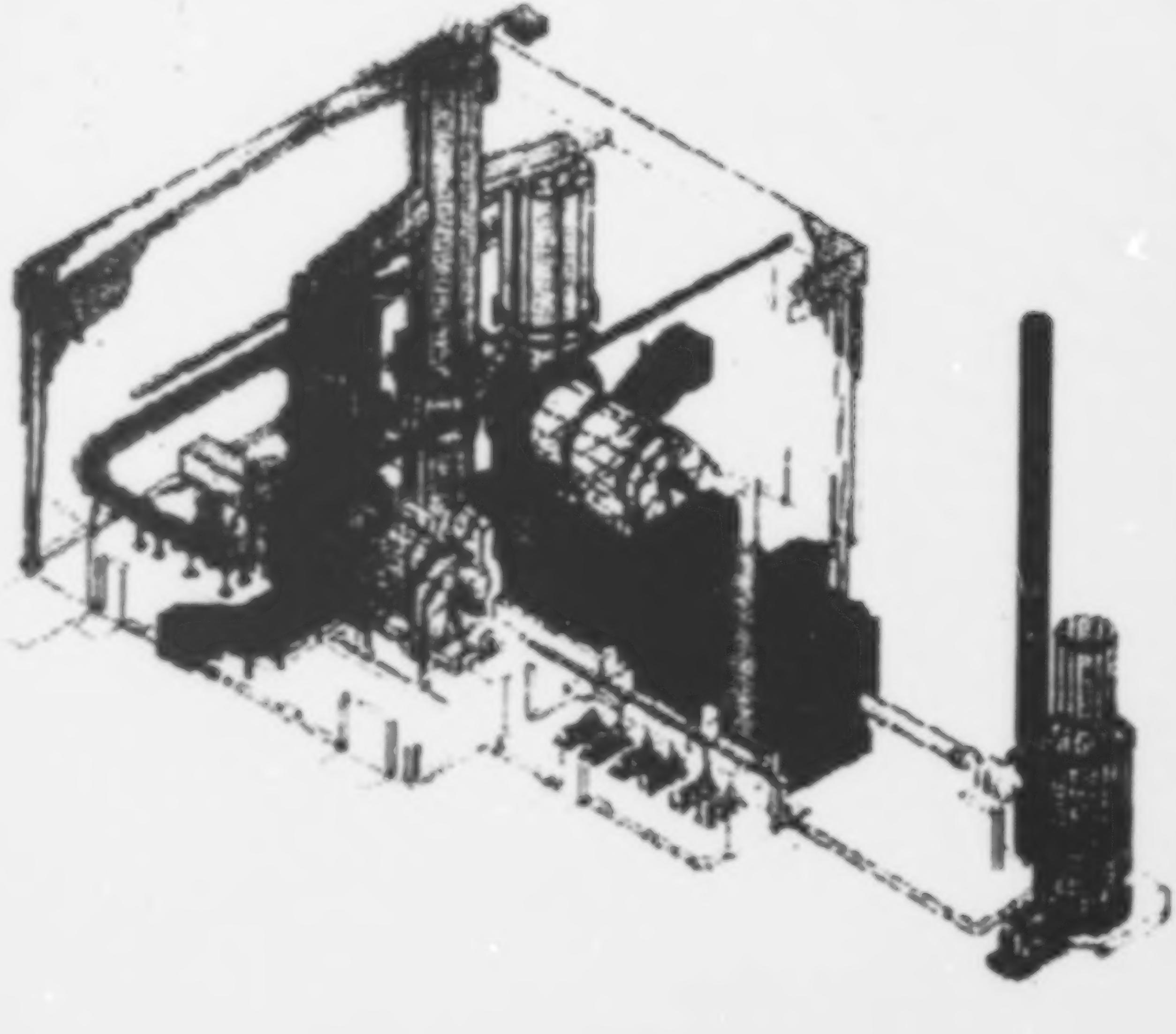
PCB DESTRUCTION AND TREATMENT TECHNOLOGIES

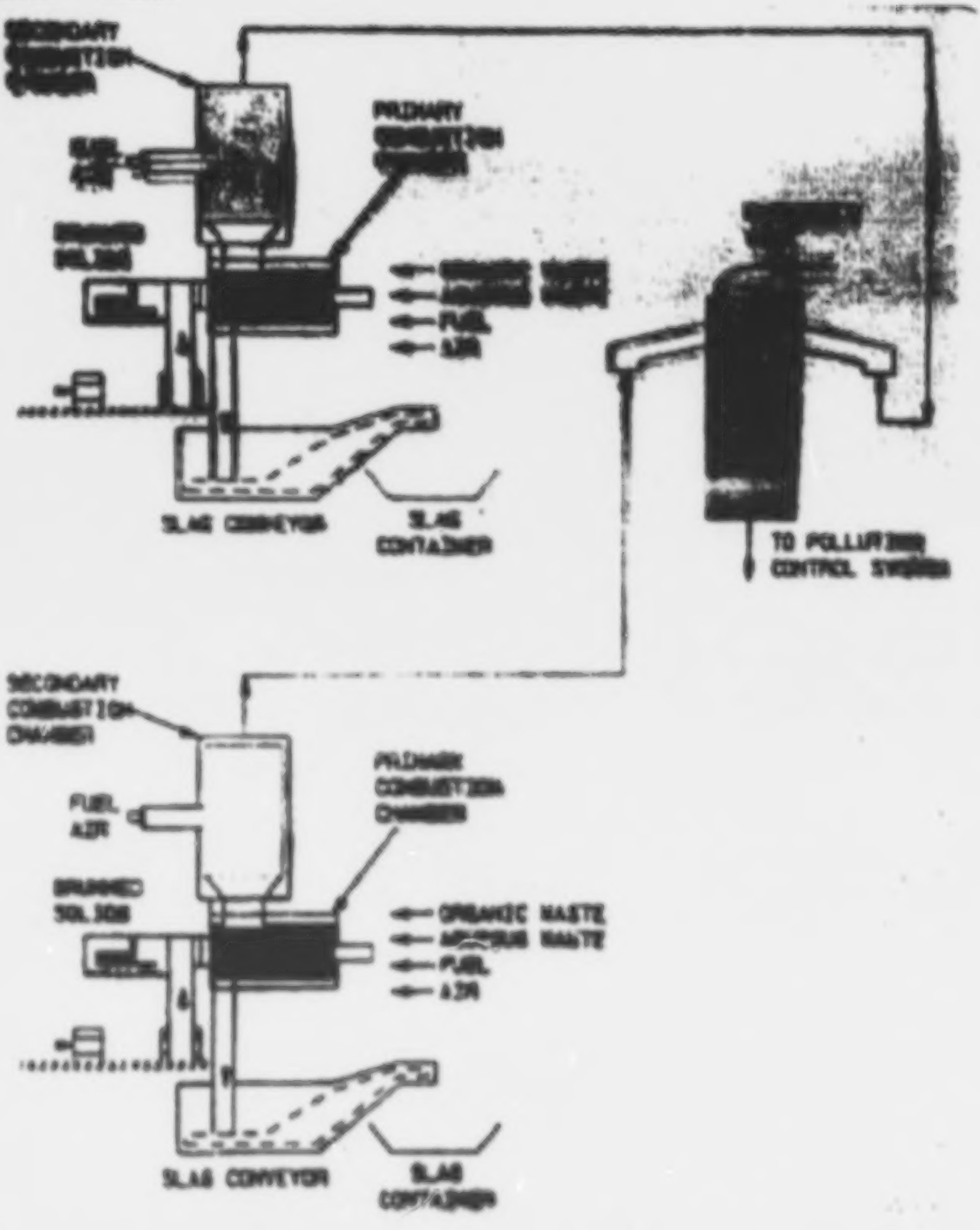
THERMAL DESTRUCTION TECHNOLOGIES

CHEMICAL DECHLORINATION PROCESSES

ALTERNATIVE PCB SOLID–WASTE TREATMENT METHODS, INCLUDING SOLVENT EXTRACTION

ISOMETRIC VIEW OF THE INCINERATOR FACILITY



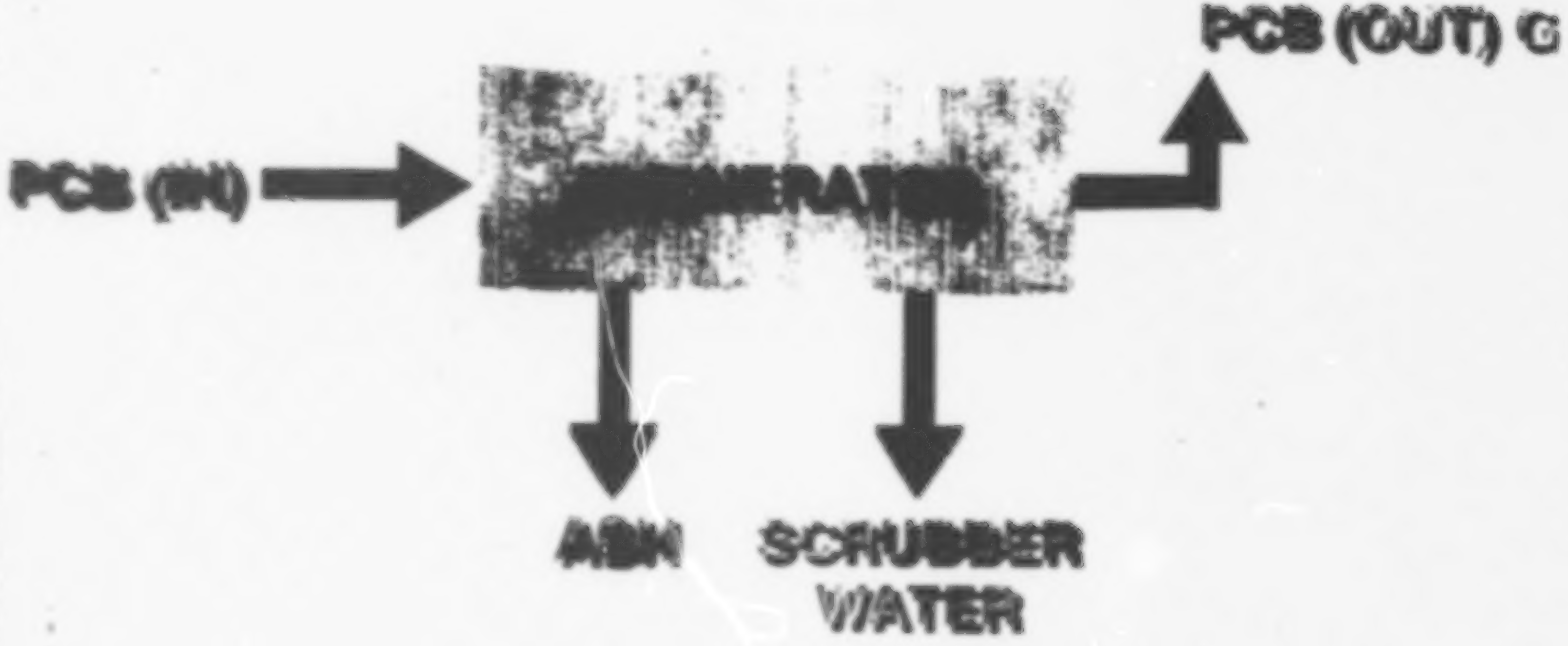

SECONDARY COMBUSTION CHAMBER
PRIMARY COMBUSTION CHAMBER
FUEL
AIR
BURNED SOLIDS
ORGANIC WASTE
AQUEOUS WASTE
FUEL
AIR
SLAG CONVEYOR
SLAG CONTAINER
TO POLLUTION CONTROL SYSTEM
SECONDARY COMBUSTION CHAMBER
PRIMARY COMBUSTION CHAMBER
FUEL
AIR
BURNED SOLIDS
ORGANIC WASTE
AQUEOUS WASTE
FUEL
AIR
SLAG CONVEYOR
SLAG CONTAINER

PROCESS FLOW DIAGRAM OF THE TWO VON ROLL ROCKING – KILN INCINERATOR UNITS

PCB's DESTROYED AT A.S.W.T.C., SWAN HILLS

TYPE	TONNES
PCB LIQUIDS	3 154
PCB SOLIDS	706
BALLASTS/CAPACITORS	52

DESTRUCTION AND REMOVAL EFFICIENCY (DRE)


PCB (IN)
INCINERATOR
PCB (OUT) G
ASH
SCRUBBER WATER

$$DRE = \frac{PCB\ (IN) - PCB\ (OUT)\ G}{PCB\ (IN)}$$

FEDERAL REGULATORY REQUIREMENTS; MOBILE PCB DESTRUCTION SYSTEMS

AIR EMISSIONS

PCBs	1MG PCBs/KG PCBs IN
PARTICULATE MATTER	50 MG/NM3
HYDROGEN CHLORIDE	75 MG/NM3
DIOXINS/FURANS*	12 NG/NM3

LIQUIDS

PCBs	5 µG/L
DIOXINS/FURANS*	0.6 NG/L

SOLIDS

PCBs	0.5 MG/KG
DIOXINS/FURANS*	1 µG/KG

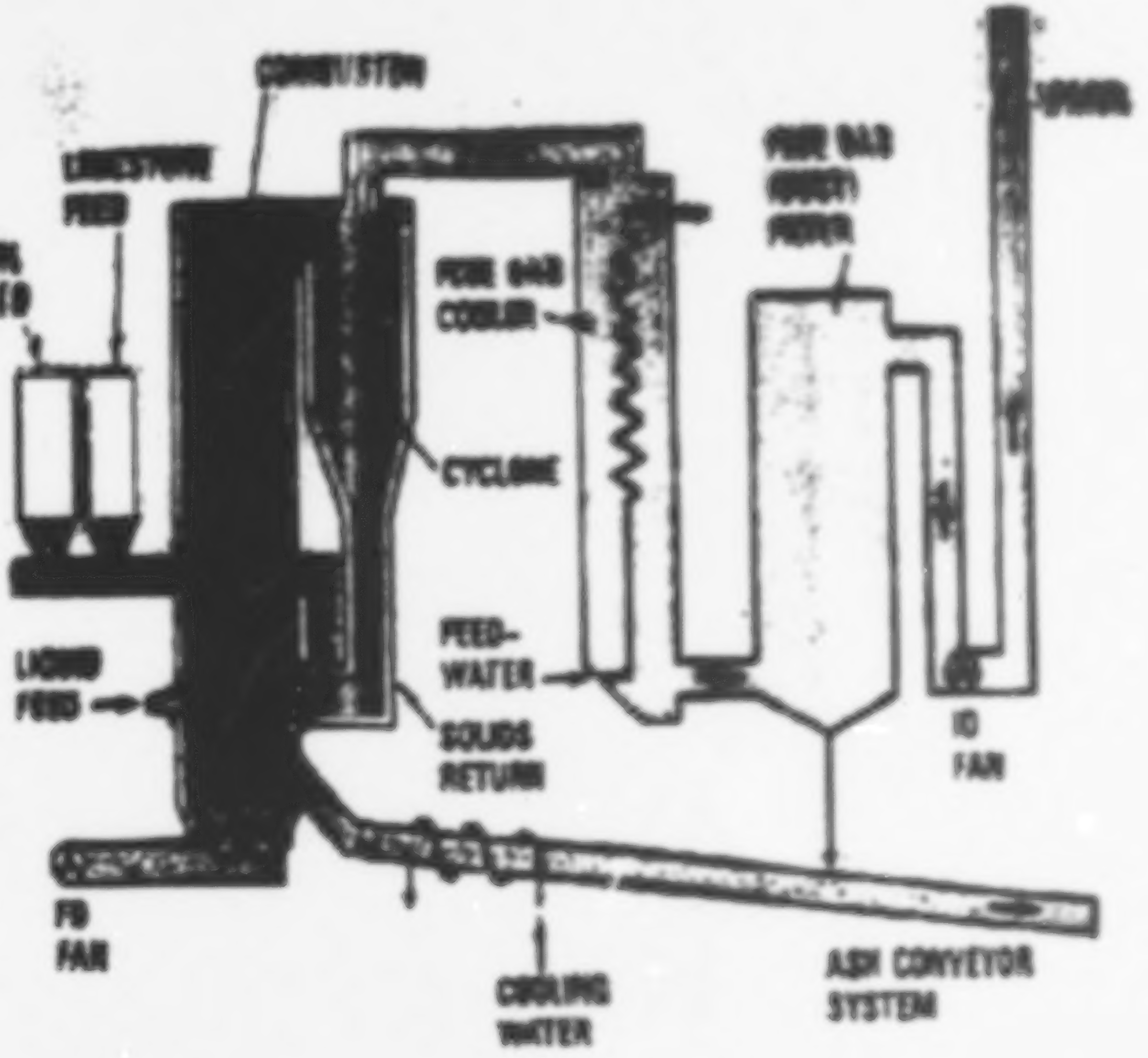
* DIOXIN/FURAN CONCENTRATIONS CALCULATED IN TERMS OF 2, 3, 7, 8–TCDD TOXIC EQUIVALENTS

TOXICITY FACTORS; 2, 3, 7, 8-SUBSTITUTED PCDDs

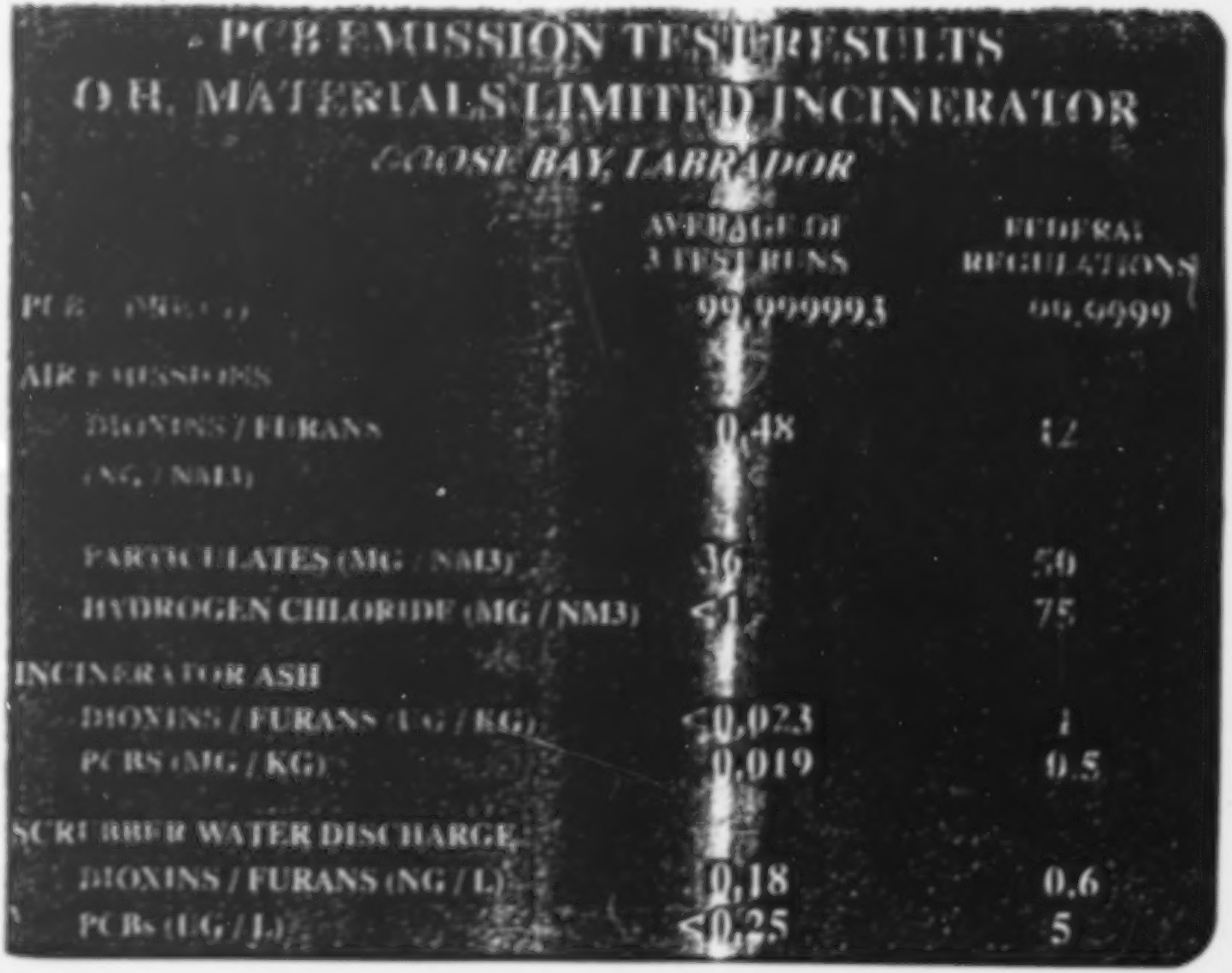
2,3,7,8-SUBSTITUTED CONGENER	TOXICITY FACTOR
2,3,7,8-T4CDD	1.0
1,2,3,7,8-P5CDD	0.5
1,2,3,4,7,8-H6CDD	0.1
1,2,3,6,7,8-H6CDD	0.1
1,2,3,7,8,9-H6CDD	0.1
1,2,3,4,6,7,8-H7CDD	0.01
08CDD	0.001

TRANSPORTABLE/MOBILE PCB INCINERATORS

COMPANY/ MODEL	TECHNOLOGY	MAX. DESIGN THROUGHPUT	ON-SITE SET-UP TIME
ENSCO/MWP 2000 TRANSPORTABLE	ROTARY KILN & SEC. COMB. CHAMBER	5 455 KG/H	4–8 WEEKS
OHM/MODIFIED SHIRCO INFRA-RD INCIN. TRANSPORTABLE	INFRARED PRIMARY/SEC. COMBUSTION CHAMBER	5 500 KG/H	3–4 WEEKS
ROY F. WESTON TRANSPORTABLE	ROTARY KILN & SEC. COMB. CHAMBER	9 091 KG/H	6 WEEKS
OGDEN ENVIRONMENTAL TRANSPORTABLE	CIRCULATING BED COMBUSTOR	4 091 KG/H	10–11 WEEKS
VESTA/ MODEL 80/ MODEL 100 MOBILE	ROTARY KILN & SEC. COMB. CHAMBER	2 270 KG/H	1 WEEK
OGDEN ENVIRONMENTAL MOBILE	CIRCULATING BED COMBUSTOR	1 000 KG/H	-------


COMBUSTOR
LIMESTONE FEED
COAL FEED
LIQUID FEED
FD FAN
CYCLONE
FEED-WATER
SOLIDS RETURN
FLUE GAS COOLER
FLUE GAS (DUST) FILTER
STACK
ID FAN
COOLING WATER
ASH CONVEYOR SYSTEM

CIRCULATING BED COMBUSTOR SCHEMATIC DIAGRAM



PCB EMISSION TEST RESULTS
O.H. MATERIALS LIMITED INCINERATOR
GOOSE BAY, LABRADOR

	AVERAGE OF 3 TEST RUNS	FEDERAL REGULATIONS
PCB (DRE %)	99.999993	99.9999
AIR EMISSIONS		
DIOXINS / FURANS (NG / NM3)	0.48	12
PARTICULATES (MG / NM3)	36	50
HYDROGEN CHLORIDE (MG / NM3)	<1	75
INCINERATOR ASH		
DIOXINS / FURANS (UG / KG)	<0.023	1
PCBS (MG / KG)	0.019	0.5
SCRUBBER WATER DISCHARGE		
DIOXINS / FURANS (NG / L)	0.18	0.6
PCBs (UG / L)	<0.25	5

SUNSET FOR PCBS: THE PLANNED PHASEDOWN OF PCBS IN USE

Lawrence Fedoruk, Controls Development Engineer
Controls Development Section, Commercial Chemicals Branch
Environment Canada

AMENDMENT TO PCB REGULATION

Sensitive Locations

Schools, daycare centres, health care facilities and senior citizen care homes including property where these buildings are located.

Water treatment plants and food and feed processing sites where PCB equipment is located in a way that a spill or leak could result in contamination of water, food or feed.

1990 CCREM - Regional Approaches

- Atlantic agreed to mobile incinerator.
- Western and Northern Region
  (Man, Sask, Alta, B.C., N.W.T)

  Western Canada Task Force on Hazardous Waste Management.

GREEN PLAN - Destroy all PCBs under federal jurisdiction by 1996.

1988 ST. BASILE-LE GRAND FIRE
(Aug.)

1988 CCREM - phase-out of PCBs by 1993 contingent on
(Sept) completion of PCB Management Plan

- sensitive facilities will be priority under an accelerated phase-out program

1989 CCREM - Ministers noted - PCB phase-out in
sensitive locations in 2 years

1988 PCB Phase-out Strategy Consultations:Status Report (July)

- of the 4 options, no one option stood out as the favoured
- phase-out in sensitive locations and phase-out in insecure indoor locations combined was favored by nearly half of the respondents

1987 PCB Phase-out Strategy Control Options Report (unpublished)

4 strategies

- 1. attrition

- 2. sensitive locations

- 3. insecure indoor locations

- 4. accelerated phase-out of all PCB equipment over specific time period

1978 Seminar and report-assessment of effect on users
re: phase-out PCBs in transformers

1982 Review of substitutes for PCBs in transformers

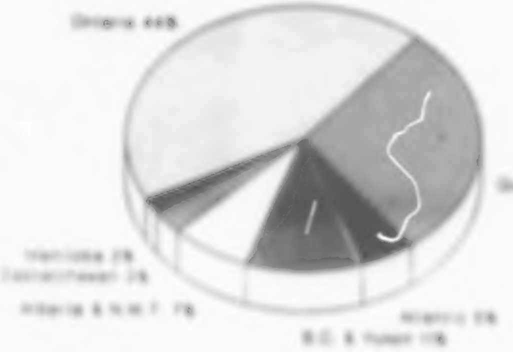
1983 A National Strategy for Accelerated Phase-out
of Chlorobiphenyls: Stage I

-sensitive locations highest priority

-availibility of destruction
facilities should govern phase-out

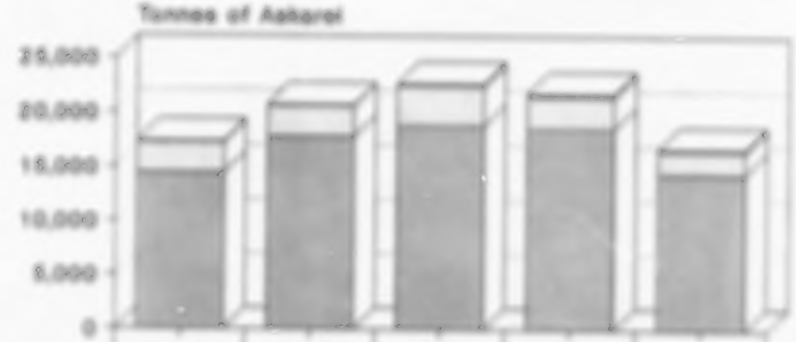
-rate of phase-out should be < rate
manufacturers can supply replacements

Distribution of In-Use PCBs by Province
(1990)



Total In-Use PCBs: 16,447 tonnes

In-Use PCB Equipment in Canada
A Comparison of Inventories from 1984 to 1990

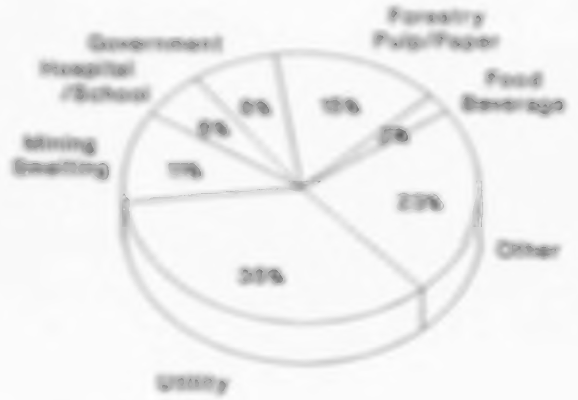


	1984	1985	1986	1987	1990
Other	160	150	300	330	270
Capacitors	2,910	2,790	3,580	2,860	2,070
Transformers	14,430	17,790	18,820	18,570	14,450

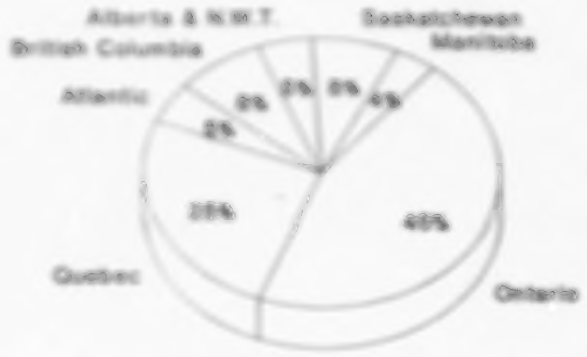
Note: In-use data not available for 1988 and 1989

Environment Canada (1990)

Distribution of In-Use PCBs



Other - Includes Cement, Chemical Manufacturing, Electrical, Petroleum, Metal Refining, Rubber, Textile, and Other Industrial Sources

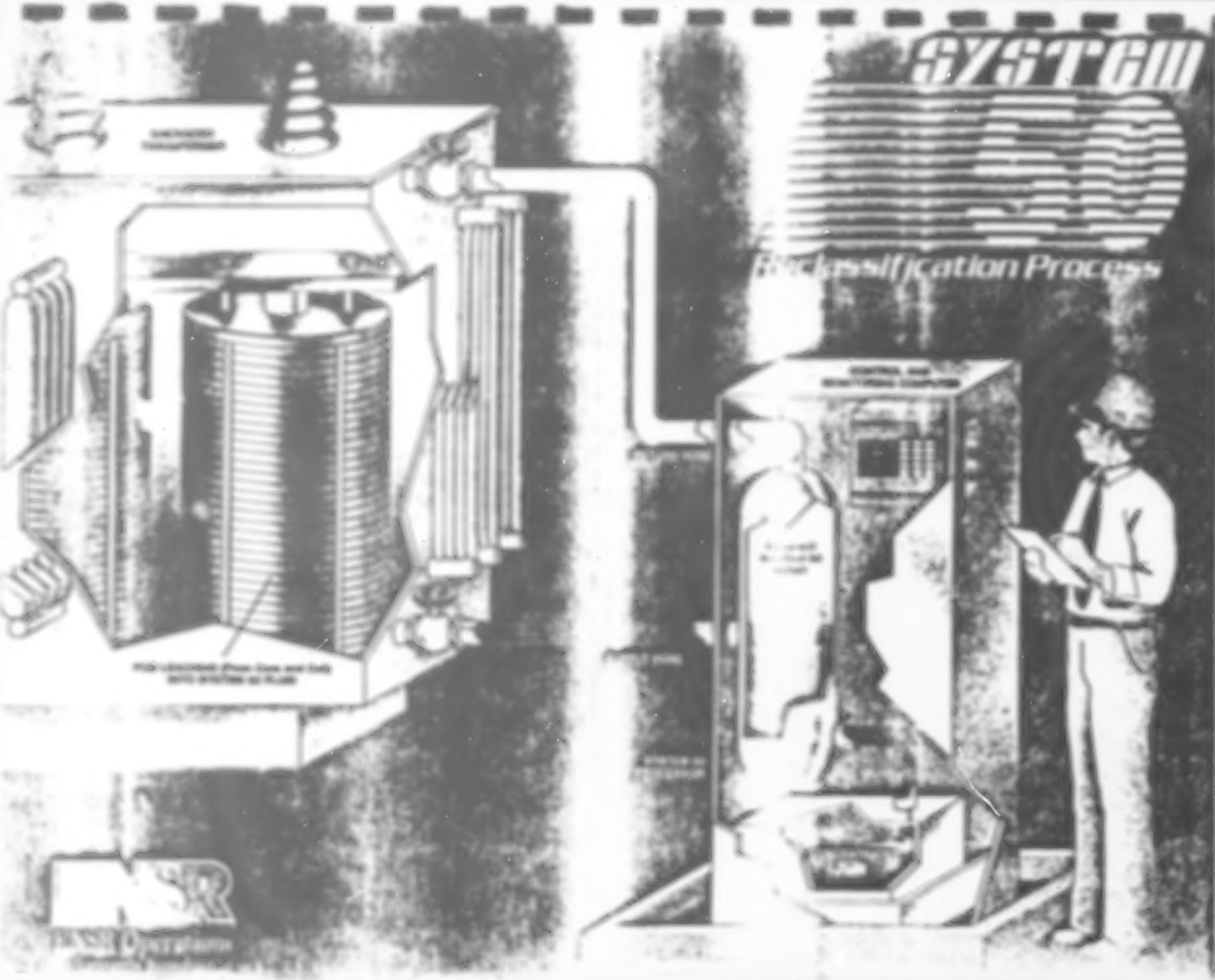


Total In-Use PCBs : 18,565 tonnes

Environment Canada (1987)

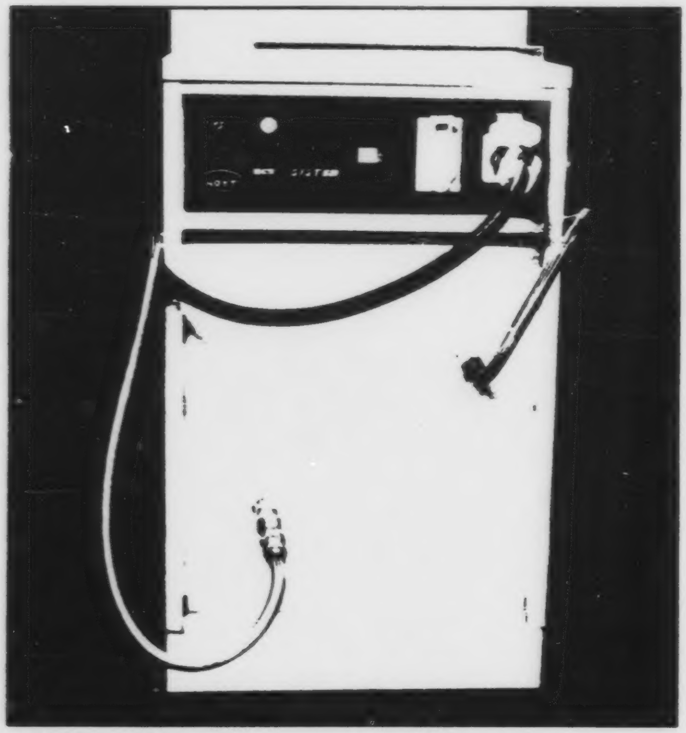
RETROFILLING AND RECLASSIFICATION OF TRANSFORMERS

Arman Garakanian, Project Supervisor, ENSR Operations Ltd.


SYSTEM
Reclassification Process
NSR
NSR Operations

System 50® Processors Are Monitored at All Times

ENSR monitors its System 50® processors using an on-board microprocessor to protect the integrity of your transformer at all times.



The System 50 processor is computer controlled, and designed for unattended use.

1. ***First***, System 50 processors are simple and small, to ***minimize the opportunity for malfunctions.***
2. ***Second***, our ***processors continuously sense and detect*** significant deviations from normal operations.
3. ***Third***, our ***processors shut down automatically*** if any significant deviations are detected.
4. ***Fourth***, our processors are equipped with **patented** ***techniques which automatically isolate the transformer from the processor*** in the event of a processor malfunction.
5. ***Fifth***, our ***processors are equipped with double containment systems*** large enough to capture and hold the total volume of fluids in processor components.

The result is an absolutely safe and reliable processor which regularly provides your transformer with clean, PCB-free and TCB-free coolant/dielectric fluid. This mode of operation assures you of the maximum overall rate of cleaning and reclassification for your transformer.

SYSTEM 50

Call ENSR Operations at (216) 452-0837 for information regarding System 50® service for retrofilling and reclassification of PCB transformers.

SYSTEM 50 SERVICE IS PERFORMED IN TWO PHASES:

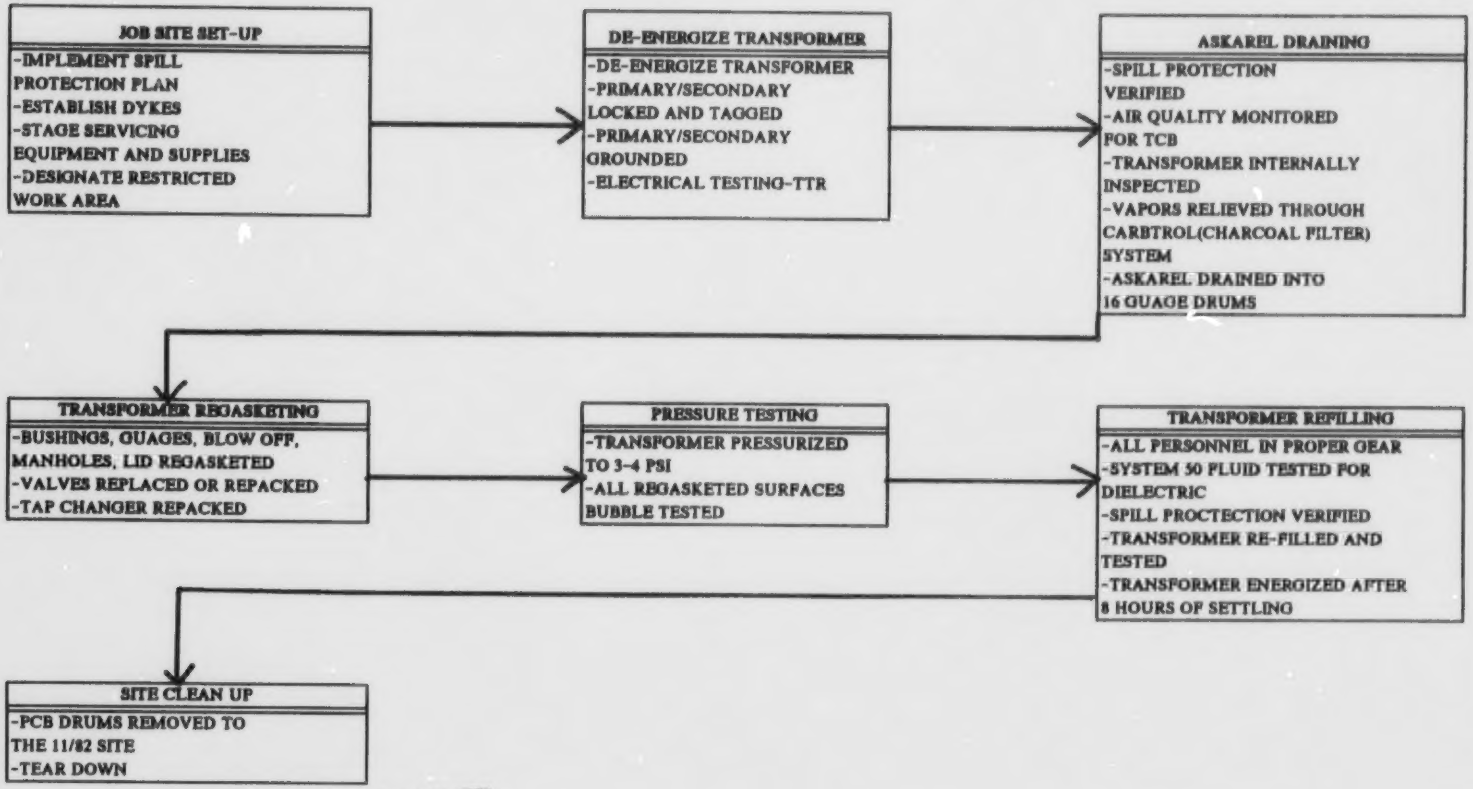
1. **MAINTENANCE PHASE** - This phase includes set-up, transformer tests, PCB drain-down, and refill with system 50 fluid. Each transformer requires a 24 hour shut-down to complete the maintenance phase. A crew of 3 technicians is required for each transformer. A Field Manager supervises the work.

2. **TAIL PHASE** - This phase includes the installation of processors, testing for PCB concentration in the System 50 fluid, processor operation, and reclassification to non-PCB status. The duration of this phase depends on transformer size and design. Transformers with a large quantity of porous (i.e. wood) material in the superstructure will take longer to reclassify. Estimated time for reclassification is approximately 9-14 months. During this period the system 50 processor is only operated as follows:

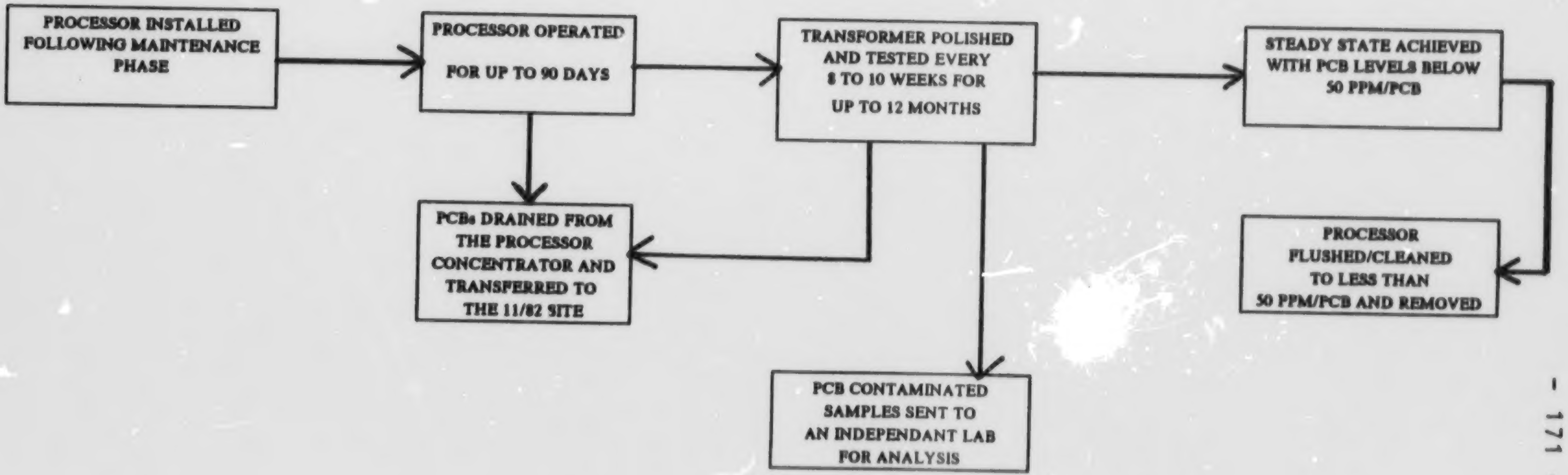
   -Immediately following retrofill - 7-30 days
   -Following the first phase - Once every 8-10 weeks

Each time the processor is started the unit remains operational for 2 to 4 days. This provides sufficient time for polishing the System 50 fluid inside the transformer. The unit is then turned off allowing for the PCBs to leach out of the wood, re-contaminating the System 50 fluid. The processor is started again to polish the fluid, and remove the PCBs from the transformer. The cycle continues until an equilibrium state has been achieved, and PCB levels remain below 50 PPM.

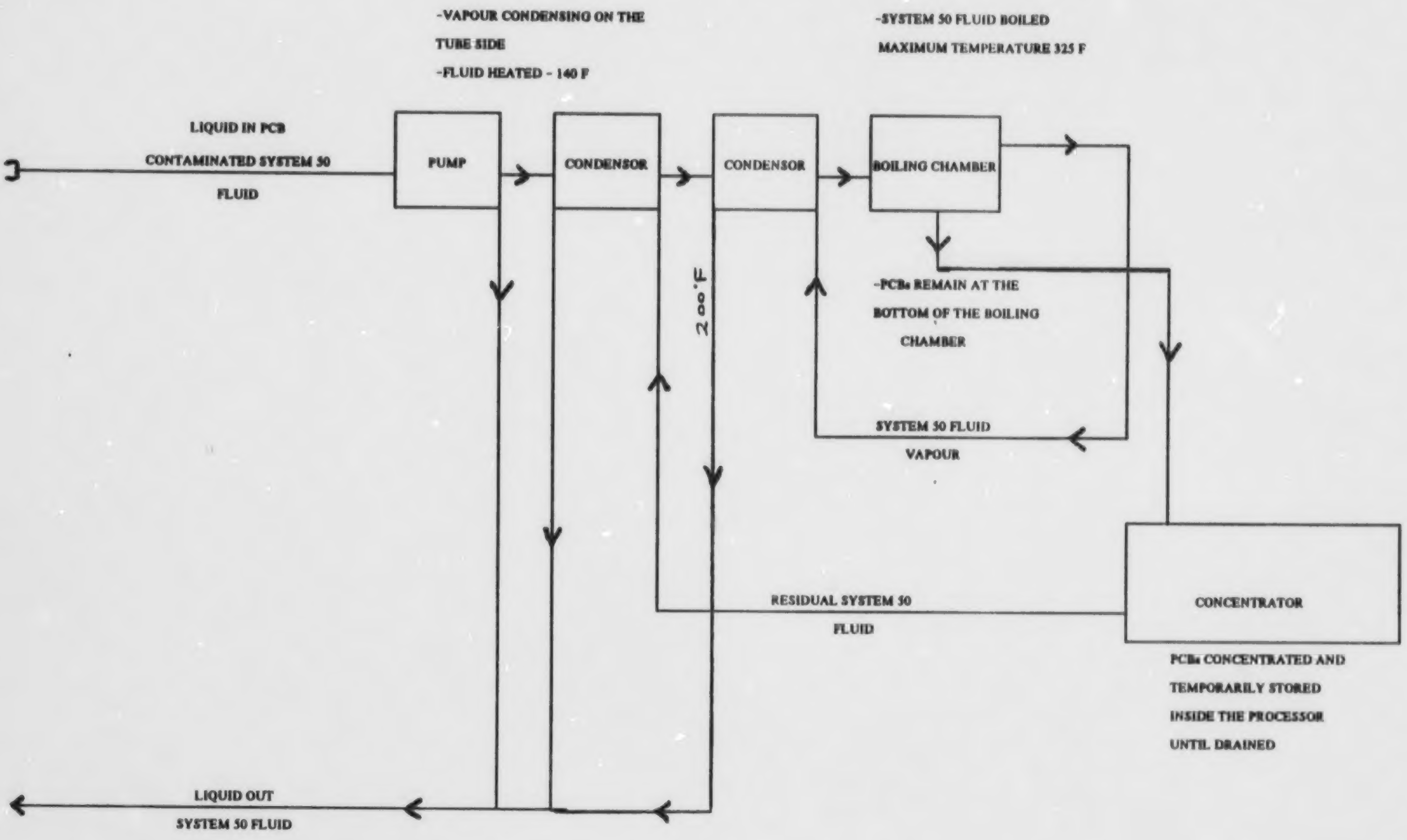
SYSTEM 50 MAINTENANCE PHASE FLOW CHART


JOB SITE SET-UP
-IMPLEMENT SPILL PROTECTION PLAN
-ESTABLISH DYKES
-STAGE SERVICING EQUIPMENT AND SUPPLIES
-DESIGNATE RESTRICTED WORK AREA
DE-ENERGIZE TRANSFORMER
-DE-ENERGIZE TRANSFORMER
-PRIMARY/SECONDARY LOCKED AND TAGGED
-PRIMARY/SECONDARY GROUNDED
-ELECTRICAL TESTING-TTR
ASKAREL DRAINING
-SPILL PROTECTION VERIFIED
-AIR QUALITY MONITORED FOR TCB
-TRANSFORMER INTERNALLY INSPECTED
-VAPORS RELIEVED THROUGH CARBTROL(CHARCOAL FILTER) SYSTEM
-ASKAREL DRAINED INTO 16 GUAGE DRUMS
TRANSFORMER REGASKETING
-BUSHINGS, GUAGES, BLOW OFF, MANHOLES, LID REGASKETED
-VALVES REPLACED OR REPACKED
-TAP CHANGER REPACKED
PRESSURE TESTING
-TRANSFORMER PRESSURIZED TO 3-4 PSI
-ALL REGASKETED SURFACES BUBBLE TESTED
TRANSFORMER REFILLING
-ALL PERSONNEL IN PROPER GEAR
-SYSTEM 50 FLUID TESTED FOR DIELECTRIC
-SPILL PROCTECTION VERIFIED
-TRANSFORMER RE-FILLED AND TESTED
-TRANSFORMER ENERGIZED AFTER 8 HOURS OF SETTLING
SITE CLEAN UP
-PCB DRUMS REMOVED TO THE 11/82 SITE
-TEAR DOWN

SYSTEM 50 TAIL-PHASE


PROCESSOR INSTALLED FOLLOWING MAINTENANCE PHASE
PROCESSOR OPERATED FOR UP TO 90 DAYS
TRANSFORMER POLISHED AND TESTED EVERY 8 TO 10 WEEKS FOR UP TO 12 MONTHS
STEADY STATE ACHIEVED WITH PCB LEVELS BELOW 50 PPM/PCB
PCBs DRAINED FROM THE PROCESSOR CONCENTRATOR AND TRANSFERRED TO THE 11/82 SITE
PCB CONTAMINATED SAMPLES SENT TO AN INDEPENDANT LAB FOR ANALYSIS
PROCESSOR FLUSHED/CLEANED TO LESS THAN 50 PPM/PCB AND REMOVED

SYSTEM 50 PROCESSOR – FLOW DESCRIPTION


-VAPOUR CONDENSING ON THE
TUBE SIDE
-FLUID HEATED - 140 F
-SYSTEM 50 FLUID BOILED
MAXIMUM TEMPERATURE 325 F
LIQUID IN PCB
CONTAMINATED SYSTEM 50
FLUID
PUMP
CONDENSOR
CONDENSOR
BOILING CHAMBER
200°F
-PCBs REMAIN AT THE
BOTTOM OF THE BOILING
CHAMBER
SYSTEM 50 FLUID
VAPOUR
RESIDUAL SYSTEM 50
FLUID
CONCENTRATOR
PCBs CONCENTRATED AND
TEMPORARILY STORED
INSIDE THE PROCESSOR
UNTIL DRAINED
LIQUID OUT
SYSTEM 50 FLUID

ENSR OPERATIONS' SYSTEM 50sm PCB TRANSFORMER RECLASSIFICATION ADVANTAGES AND BENEFITS

RISK MANAGEMENT BENEFITS

RISK MANAGEMENT BENEFITS

As PCB incineration is not possible in most provinces in Canada, Risk Managers may eliminate or substantially reduce their PCB risk by immediately moving PCBs out of the transformer, now in high risk locations, to approved secure low risk storage locations.

Impact and Benefits

1.) PCBs under control in secure storage.

2.) Immediate health risk reduction.

3.) Immediate real estate risk reduction.

4.) Reduction of risk to premature loss of equipment use. (Due to lack of maintenance on PCB transformers.)

5.) Reduction in long term risk of transformer carcass. (Long term storage not required.)

TECHNICAL BENEFITS - SYSTEM 50

TECHNICAL BENEFITS - SYSTEM 50

System 50's enhanced leaching technology and applied transformer service is executed efficiently and may enhance transformer life.

Benefits

1.) Minimal 18-24 hour shutdown required.

2.) Complete transformer overhaul. (Regasketing and electrical tests verify transformer integrity.)

3.) Thermal properties of System 50 Fluid enhance transformer cooling and control of possible hot spots.

4.) Insulating properties of System 50 Fluid better than askarel.

5.) System 50 insures controlled leaching of both PCBs and TCBs, thus enabling reclassification guarantees to be met.

COMMERCIAL BENEFITS

COMMERCIAL BENEFITS

Askarel (PCB) transformers properly maintained under average loading conditions may have a life expectancy of 60- years. The remaining life of the transformer may be fully utilized with System 50^{sm} Service.

Benefits

1.) System 50 averages 60-75% of transformer replacement cost.

2.) System 50 will not affect insurance underwriting costs.

3.) System 50 precludes capital expenditure for new transformers, purchasing costs and costs associated with expediting deliveries.

4.) System 50 precludes costs associated with substation reconstruction and building repair. (Item often associated with replacement.)

5.) Costs associated with buss work modifications are not required with System 50.

6.) Small storage area required to store only drums, thus reducing overall costs compared with storing drums and transformers.

7.) The short maintenance duration reduces disruption to power. Hence, building revenues or production revenue losses are minimal.

FEDERAL REQUIREMENTS FOR INTERNATIONAL AND INTER-PROVINCIAL TRANSPORT

Stewart Teasell, Contaminants Officer, Environmental Protection
Ontario Region, Environment Canada

FEDERAL LEGISLATION PERTAINING TO THE MOVEMENT OF PCBS

1) **TRANSPORTATION OF DANGEROUS GOODS ACT (TDGA)**

   - REGULATIONS SET FORTH REQUIREMENTS FOR HANDLING, OFFERING FOR TRANSPORT, OR TRANSPORTING PCBS

   - INCLUDES REQUIREMENTS FOR CLASSIFICATION, DOCUMENTATION, SAFETY MARKS, PACKAGING, TRAINING OF PERSONNEL

2) **CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA)**

   - PCB WASTE EXPORT BAN (EXCEPT TO U.S.)

   - HAZARDOUS WASTE IMPORT-EXPORT REGULATIONS (PROPOSED)

DEFINITIONS RELATING TO PCBS UNDER THE TRANSPORTATION OF DANDEROUS GOODS REGULATIONS

1) PCB MIXTURE

A MIXTURE CONTAINING PCB IN A CONCENTRATION THAT IS GREATER THAN 50 PARTS PER MILLION BY WEIGHT.

2) PCB ARTICLE

ANY ARTICLE THAT CONTAINS A PCB MIXTURE, BUT DOES NOT INCLUDE ELECTRICAL EQUIPMENT, A PACKAGING OR A CONTAINER.

3) ELECTRICAL EQUIPMENT

MEANS A PIECE OF EQUIPMENT THAT:

- CONTAINS A PCB MIXTURE
- IS USED IN THE TRANSMISSION OR DISTRIBUTION OF 60 HZ, 25 HZ OR HIGH VOLTAGE DIRECT CURRENT ELECTRICAL POWER
- DESIGNED TO PERFORM A FUNCTION OTHER THAN SOLELY TO CONTAIN THE PCB MIXTURE
- IS NORMALLY LEAK-FREE WHILE IN SERVICE

4) SERVICEABLE ELECTRICAL EQUIPMENT

INCLUDES ELECTRICAL EQUIPMENT THAT:

- MAY SHOW EVIDENCE OF LEAKAGE
- IS TEMPORARILY OUT OF SERVICE FOR PURPOSE OF MAINTENANCE, REPAIR OR RELOCATION, AND
- IS NOT IN TEMPORARY STORAGE FOR THE PURPOSE OF DISPOSAL

EXEMPTIONS FOR PCBS UNDER TDGA

- EXEMPTION FOR WASTE PCBS WHERE THE WASTE IS A PCB MIXTURE, A PCB ARTICLE, OR, ELECTRICAL EQUIPMENT THAT CONTAINS A PCB MIXTURE, WHERE THE QUANTITY OF PCB MIXTURE IS NOT GREATER THAN 500G.

- CONDITIONAL EXEMPTION FOR PCB SAMPLES

- CONDITIONAL EXEMPTION FOR SERVICEABLE ELECTRICAL EQUIPMENT THAT IS SHIPPED BY ROAD OR RAIL

- CONDITIONAL EXEMPTION FOR PCB ARTICLES SHIPPED BY ROAD OR RAIL

DOCUMENTATION REQUIREMENTS UNDER TDGA

- **FOR WASTE PCB SHIPMENTS THE HAZARDOUS WASTE MANIFEST MUST BE COMPLETED AND MUST ACCOMPANY THE SHIPMENT**

- **IN CASE OF INTERNATIONAL SHIPMENTS OF PCB WASTE TRANSPORT CANADA AND ENVIRONMENT CANADA MUST BE NOTIFIED VIA PRENOTIFICATION FORM SIXTY DAYS IN ADVANCE OF SHIPMENT**

- **IN CASE OF INTER-PROVINCIAL SHIPMENT OF PCB WASTE PRENOTIFICATION MUST BE SUBMITTED BY CONSIGNOR THIRTY DAYS IN ADVANCE OF SHIPMENT**

REQUIREMENTS FOR SAFETY MARKS UNDER TDGA

- PROPER LABELS MUST BE POSTED ON EACH SMALL CONTAINER AND PACKAGE THAT CONTAIN PCBS. CLASS 9 TDGA LABEL AND PCB WARNING LABEL REQUIRED FOR PCB SHIPMENTS

- PROPER PLACARDS MUST BE PLACED ON LARGE CONTAINER OR TRANSPORT UNIT CARRYING THE PCB LOAD. PLACARD MUST BE THE ONE FOR CLASS 9 AND MUST INCLUDE PRODUCT IDENTIFICATION NUMBER 2315

SAFETY REQUIREMENTS FOR HANDLING, OFFERING FOR TRANSPORT AND TRANSPORTING PCB SHIPMENTS

- TDGA SPECIFIES HANDLING AND PACKAGING REQUIREMENTS FOR, PCB MIXTURES, PCB ARTICLES AND ELECTRICAL EQUIPMENT CONTAINING PCB MIXTURE FOR ROAD AND RAIL TRANSPORT

- FOR INTER-PROVINCIAL SHIPMENTS OF PCB WASTE, THE CONSIGNOR MUST ARRANGE FOR AN INSPECTION OF THE CONSIGNMENT AT LEAST SEVEN DAYS IN ADVANCE OF THE EXPECTED SHIPMENT DATE

- **REQUIREMENT FOR PERSON WHO HAS THE CHARGE, MANAGEMENT OR CONTROL OF THE PCB SHIPMENT AT THE TIME OF A DANGEROUS OCCURRENCE INVOLVING THE SHIPMENT, TO IMMEDIATELY NOTIFY SPECIFIED AUTHORITIES OF THE OCCURRENCE**

- **REQUIREMENT FOR THE EMPLOYER OF THE PERSON WHO HAD THE CHARGE, MANAGEMENT OR CONTROL OF THE PCB SHIPMENT AT THE TIME OF THE DANGEROUS OCCURRENCE TO SUBMIT A WRITTEN REPORT ON THE INCIDENT TO TRANSPORT CANADA WITHIN 30 DAYS**

TRAINING REQUIREMENTS UNDER TDGA

- EVERY PERSON WHO HANDLES, OFFERS FOR TRANSPORT OR TRANSPORTS PCBS MUST BE A TRAINED PERSON OR PERFORMING HIS DUTIES UNDER THE DIRECT SUPERVISION OF A TRAINED PERSON

- EMPLOYER'S RESPONSIBILITY TO PROVIDE TRAINING FOR HIS PERSONNEL AND TO PROVIDE THEM WITH A TRAINING CERTIFICATE

- TRAINING CERTIFICATE VALID FOR A PERIOD OF 36 MONTHS

- EMPLOYER MUST RETAIN EXPIRED TRAINING CERTIFICATES FOR A PERIOD OF TWO YEARS FROM THE DATE OF THEIR EXPIRATION

ONTARIO REQUIREMENTS FOR TRANSPORTATION BY ROADWAY

Wayne Herrick, Environmental Officer, Kington Regional Office
Ontario Ministry of the Environment

SESSION 3

ENVIRONMENTAL EMERGENCIES AND CONTAMINATED SITES

Moderator: Doug Hickey, Manager, Dangerous Goods Program
Aircraft Services Directorate, Transport Canada

ENVIRONMENTAL EMERGENCY PROCEDURES IN ONTARIO LEGISLATED AND NON-LEGISLATED

Jean Patrice Auclair, Regional Environmental Emergency Co-ordinator
Environmental Emergency Division, Toronto Office
Environmental Protection, Ontario Region
Environment Canada

(See Hand-out)

CONTINGENCY PLAN DEVELOPMENT

CASE STUDY: THE IMPLEMENTATION OF A CONTINGENCY PLAN

ENVIRONMENTAL EMERGENCY TRAINING METHODS

Cliff Holland, Director of Training, Spill Management Inc.

I ABOUT THE SPEAKER

Cliff Holland has worked as a laborer, plant manager, marketing manager, trainer and responder in the waste management industry since 1980.

During this time he played an instrumental role in helping to establish Canada's first transfer sites designated for laboratory-sized chemical waste; operating Central Ontario's first dewatering and fixation plant; negotiating Canada's first household hazardous waste day program in conjunction with the Region of Kitchener-Waterloo and the Ontario Ministry of the Environment.

His duties have found him working in co-operation with municipal bomb squads in the pickup, transportation and disposal of shock-sensitive and unstable products.

The common sense approach to hazardous and non-hazardous material incidents used by Spill Management Inc. has been developed from our experience as an initial response co-ordinator, site restoration contractorand disposal company handling hazardous materials. For more than ten years, we have been evaluating incidents and providing response services.

II ABOUT THE COMPANY

Spill Management Inc. is a member of the Ontario Association of Fire Chiefs, the Canadian Association of Fire Chiefs and the U.S. National Fire Protection Association. The NFPA is internationally recognized for its definition of competency materials written for the safety of the individual in protecting life, property and the environment during a hazardous materials spill incident.

III ABOUT THE COURSES

Varied courses for varying requirements

Spill Management courses are customized to the client's risks and hazards and can be integrated into existing in-house training programs. An evaluation is performed before course certificates are presented.

Courses are designed to meet the specialized needs of:

- **Dealing with spills: Laboratory size spills up to large volume discharges of a thousand gallons per minute.**
- **Countermeasures** to control liquid spills on land or on inland water ways.
- **Industry**: hands-on workshops are site-specific and product specific to help deal with the risks, hazards and environmental conditions unique to your industrial site.
- **Municipal and Regional Responses**: Hands-on training co-ordinates the emergency response services of the Fire Department, the support services of the Works Departments and the resource services of the Municipal and/or Region Laboratories
- **Hazardous Material Chemistry Course**: Helps non-technical personnel identify and verify known and unknown substances for response safety.
- **Certifying responders to recognized response standards.**

Spill Management courses allow the participants to deal with the actual chemicals and emergency conditions that may arise in their work environment.

Why develop a contingency plan?

- To ensure the safety of people, property and the environment
- For moral, economic and legal reasons

What should a contingency plan provide?

- It should provide an **action plan** and a **plan of action** to stabilize and/or control an emergency situation.
- It should be a **working tool** to deal with the **priorities** of a spill.
- It should be an administrative guide to provide **vital information**.

How to make a Contingency Plan work for you!

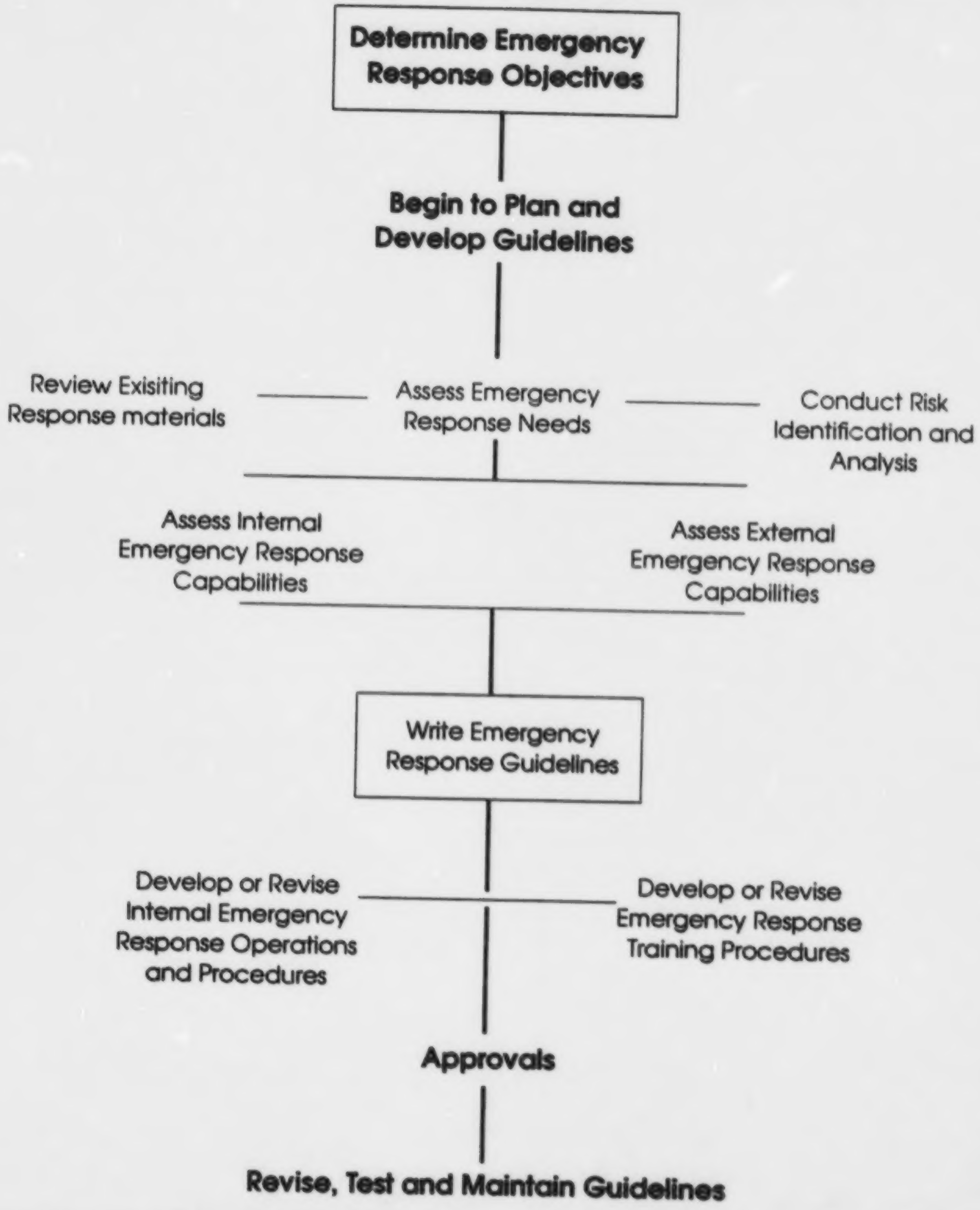
DUAL PURPOSE CONTINGENCY PLAN

Formatting

Administration Manual (Plan of Action)	Working Manual (Action Plan)
Introduction	**Reporting Emergency Incidents**
Preparedness	**Suppliers Lists (Services & Supplies)**
Response Procedures	**Response Procedures**
Reporting Emergency Incidents	**Site Information**
Site Information	**Technical Information**
Technical Information	
Suppliers Lists (Services & Supplies)	**Introduction**
Glossary of Terms	**Preparedness**
	Glossary of Terms

Common Faults in Contingency Planning

- Regular reporting systems do not always facilitate the urgent communication required.
- Plans tend to be organized based on the authority of individuals rather than the priority of the emergency.



Determine Emergency Response Objectives

Begin to Plan and Develop Guidelines

Review Exisiting Response materials

Assess Emergency Response Needs

Conduct Risk Identification and Analysis

Assess Internal Emergency Response Capabilities

Assess External Emergency Response Capabilities

Write Emergency Response Guidelines

Develop or Revise Internal Emergency Response Operations and Procedures

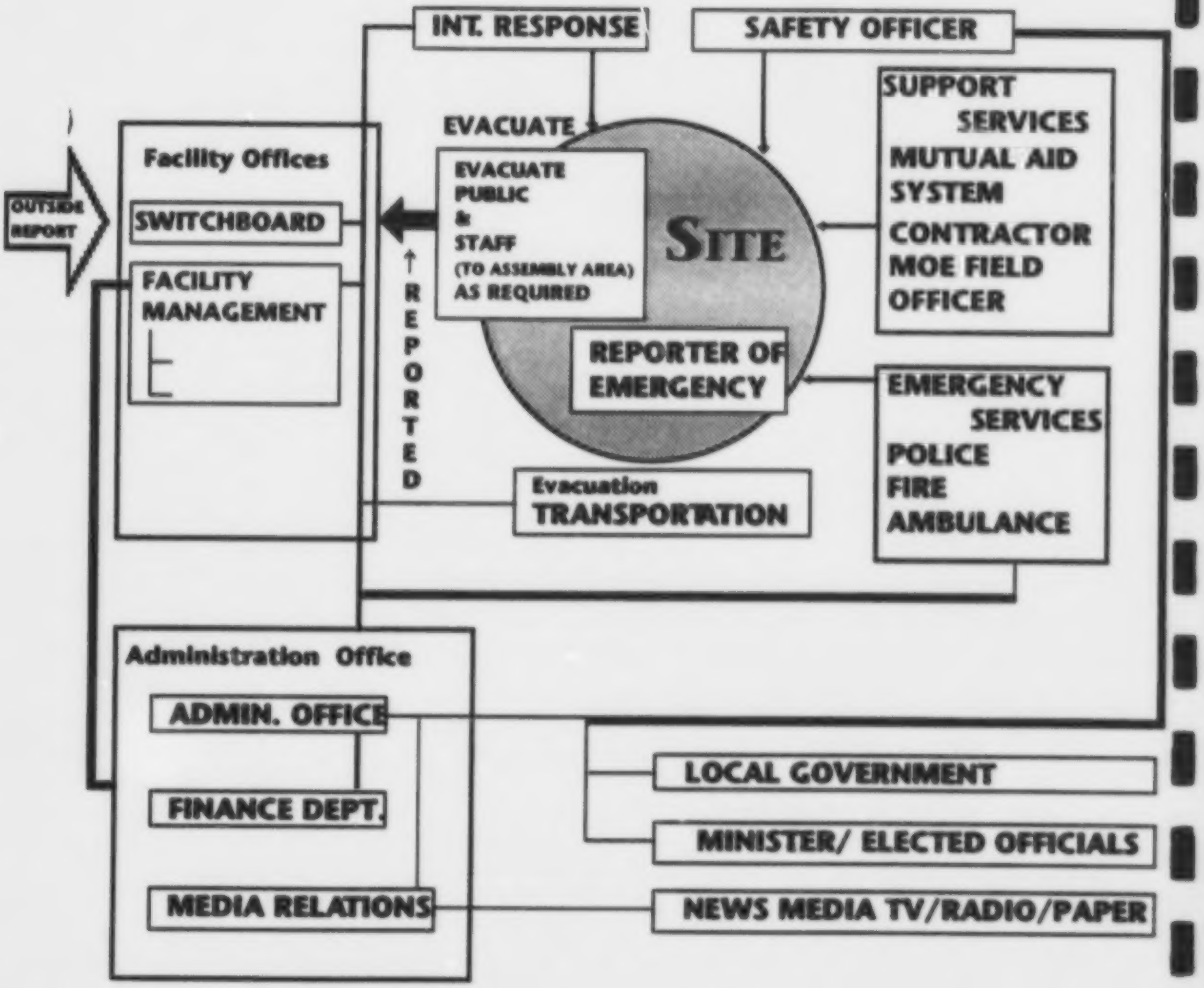
Develop or Revise Emergency Response Training Procedures

Approvals

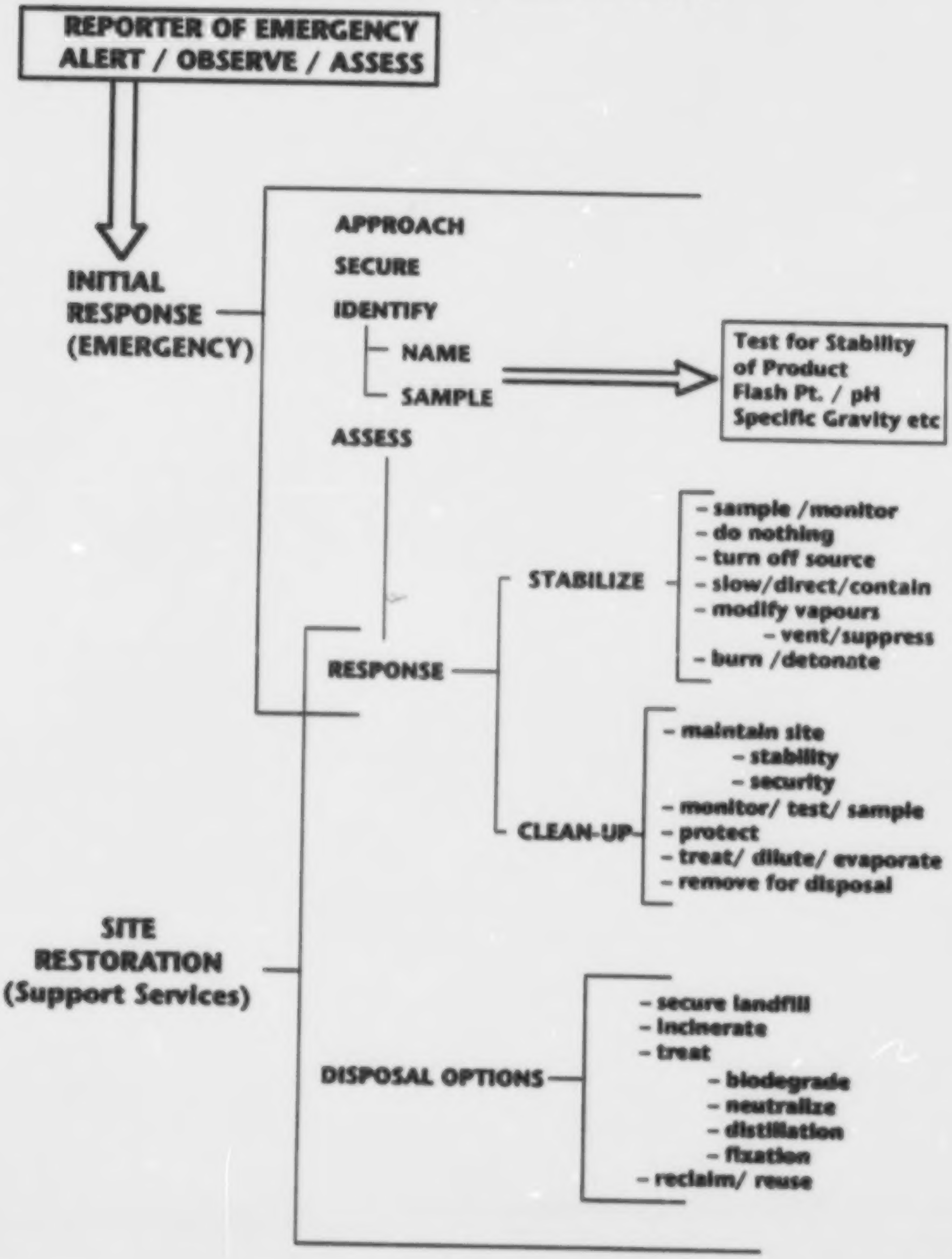
Revise, Test and Maintain Guidelines

- Mark the key areas in red.
- Discuss the problems and limitations of each area.
- Develop an action plan to suit each area.
- Prepare your plan from the point of view of each area/person's responsibility e.g. Safety Officer, Finance Department

RESPONSE ACTIVATION CHART


INT. RESPONSE
SAFETY OFFICER
OUTSIDE REPORT
Facility Offices
SWITCHBOARD
FACILITY MANAGEMENT
EVACUATE
EVACUATE PUBLIC & STAFF (TO ASSEMBLY AREA) AS REQUIRED
↑ REPORTED
SITE
REPORTER OF EMERGENCY
SUPPORT SERVICES
MUTUAL AID SYSTEM
CONTRACTOR
MOE FIELD OFFICER
EMERGENCY SERVICES
POLICE
FIRE
AMBULANCE
Evacuation TRANSPORTATION
Administration Office
ADMIN. OFFICE
FINANCE DEPT.
MEDIA RELATIONS
LOCAL GOVERNMENT
MINISTER/ ELECTED OFFICIALS
NEWS MEDIA TV/RADIO/PAPER

SPILL RESPONSE ACTIONS



REPORTER OF EMERGENCY
ALERT / OBSERVE / ASSESS

INITIAL RESPONSE (EMERGENCY)
- APPROACH
- SECURE
- IDENTIFY
  - NAME
  - SAMPLE

Test for Stability of Product
Flash Pt. / pH
Specific Gravity etc

- ASSESS
- RESPONSE
  - STABILIZE
    - sample /monitor
    - do nothing
    - turn off source
    - slow/direct/contain
    - modify vapours
      - vent/suppress
    - burn /detonate
  - CLEAN-UP
    - maintain site
      - stability
      - security
    - monitor/ test/ sample
    - protect
    - treat/ dilute/ evaporate
    - remove for disposal

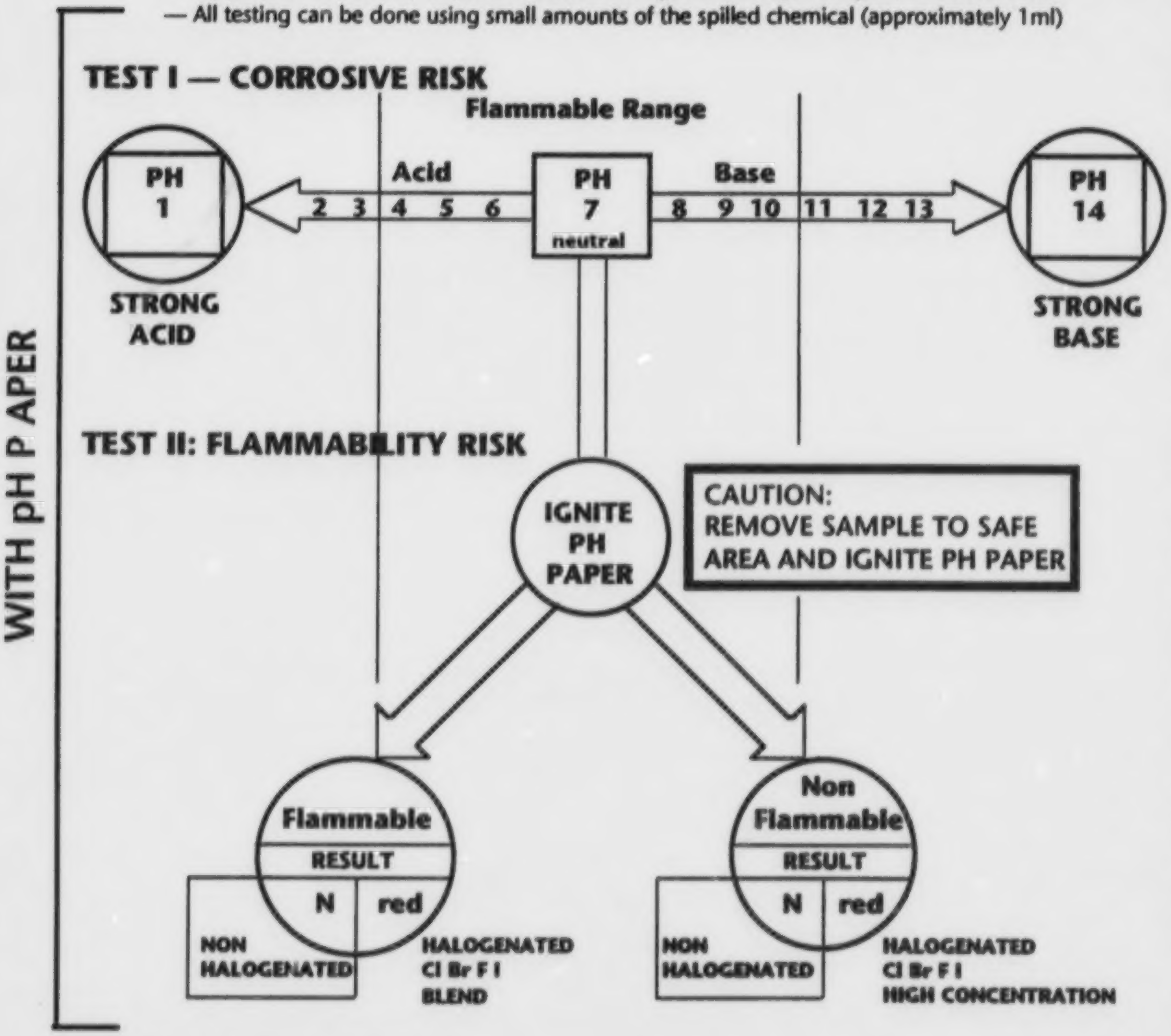
SITE RESTORATION (Support Services)
- DISPOSAL OPTIONS
  - secure landfill
  - incinerate
  - treat
    - biodegrade
    - neutralize
    - distillation
    - fixation
  - reclaim/ reuse

CHEMICAL STABILITY TEST

Note:
- This stability test method is designed to help initial responders identify and/or verify known and ur known products for phsyical and chemical properties at a spill site.
- Water and air reactive chemicals can be tested by subjecting small amounts to air or water.
- Responders can suit up to protect themselves against toxicity/biological/radioactive risks
- All testing can be done using small amounts of the spilled chemical (approximately 1ml)

TEST I — CORROSIVE RISK

TEST II: FLAMMABILITY RISK


Flammable Range
PH 1
STRONG ACID
Acid
2 3 4 5 6
PH 7 neutral
Base
8 9 10 11 12 13
PH 14
STRONG BASE
WITH pH P APER
IGNITE PH PAPER
CAUTION: REMOVE SAMPLE TO SAFE AREA AND IGNITE PH PAPER
Flammable
RESULT
N
red
NON HALOGENATED
HALOGENATED Cl Br F I BLEND
Non Flammable
RESULT
N
red
NON HALOGENATED
HALOGENATED Cl Br F I HIGH CONCENTRATION

TEST III – OXIDIZER RISK

STARCH PAPER

RESULTS: **WHITE:– NO OXIDIZER**
DARK BLUE OR BLACK:– OXIDIZER PRESENT

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Density of Gases

Gas	Density grams/liter(STP)	Gas	Density grams/liter(STP)
Ammonia	0.771	Hydrogen chloride	1.636
Carbon Dioxide	1.977	Hydrogen sulfide	1.539
Carbon Monoxide	1.250	Methane	0.714
Chlorine	3.124	Nitrogen	1.251
Dinitrogen monoxide	1.977	Nitrogen monoxide	1.340
Ethyne (acetylene)	1.169	Oxygen	1.429
Hydrogen	0.089	Sulphur dioxide	2.927

Lighter than air

GENERAL RULES FOR SOLUBILITY

1. All **sodium**, **potassium**, and **ammonium** compounds are soluble in water.
2. All **nitrates**, **chlorates**, and **acetates** are soluble.
3. All **chlorides**, **bromides**, and **iodides** are soluble except those of **silver**, **lead**, and **mercury** (mercurous).
4. All **sulphates** are soluble except those of **barium**, **lead calcium** (slightly), and **silver** (slightly).
5. All **hydroxides** are insoluble except those of **sodium**, **potassium**, **ammonium**, **calcium**, and **barium**.
6. All sulphides are insoluble except those of **sodium**, **potassium**, **ammonium**, **calcium**, and **barium**.
7. All **carbonates**, **phosphates**, and **silicates** are insoluble except those of **sodium**, **potassium**, and **ammonium**.

SOLUBILITY OF GASES IN WATER

Volume of gas at STP that can be dissolved in 1 volume of water

Gas	10°C
Air	0.0228
Ammonia	910.4
Carbon dioxide	1.194
Chlorine	3.148
Hydrogen	0.0196
Hydrogen chloride	473.9
Hydrogen sulfide	3.399
Nitrogen	0.0186
Sulphur dioxide	56.65

COMPARISON OF ORGANIC AND INORGANIC COMPOUNDS

	Organic Compounds	Inorganic Compounds
1. Constituent elements	Carbon always; hydrogen usually; oxygen often; nitrogen,halogens, sulphur, phosphorus, etc.	All elements (except inert gases) including carbon in carbonates, and carbides,
2. Melting and Boiling Points	Usually Low.	Usually High.
3. Effect of heat	Practically all decompose at higher temperatures (above 350°C.)	Usually resist decomposition.
4. Solubility	Most have low solubility in water and high solubility in organic liquids.	Many are soluble in water but not soluble in organic liquids.
5. Ionization	Most are non-electrolytes; if any ionize, usually they are weak electrolytes.	Usually good electrolytes.

General Properties of Metals and Non-Metals

Metals	Non-Metals
Physical Properties	
1. Good conductors of heat.	1. Poor conductors of heat.
2. Good conductors of electricity.	2. Poor conductors of electricity, except graphite and selenium
Chemical Properties	
1. All form oxides either by direct combination or by some intermediate reaction.	1. All form oxides either by direct combination or by some intermediate reaction.
2. Metallic oxides are basic anhydrides.	2. Non-metallic oxides are acid anhydrides.
	3. Non-metals react with metals to form salts.

Decontamination for Site:

If neutralizing an area, to prevent over neutralizing use:

- (a) household vinegar for base spills
- (b) baking soda (liquid/solid) for acid spills
- (c) Javex for cyanides

Decontamination for Personnel

In most situations, decontamination will not be sophisticated. However, a structured approach will prevent the tracking of contaminants.

DECONTAMINATION PROCEDURES
Personnel enter decontamination area and drop tools on contaminated side.
Remove as much contamination as possible. Washdown is conducted inside diked area.
Remove SCBA to contaminated side or don new SCBA from clean side and re-enter work area.
Remove protective clothing and place on contaminated side.
Personal Decontamination Remove all personal clothing. Personal showering using soap and sponges. Personal dry off. Personal medical evaluation and treatment as necessary
Identify personnel. Complete field records. e.g. - record of personnel - activities performed - personal protective equipment worn
Transport personnel to hospital or to a fixed decon facility as necessary.

Protective Equipment

Note:
The most typical type of spill, personnel will clean up will not require encapsulating suits. However, the situation may call for modified protection to basic suits.

Increasing the level of protection to a basic suit can be achieved by

(a) pulling the cuff of the sleeves down over the gloves and boots respectively.

(b) using "duct" tape (1-1/2" to 2") to tape sleeves to gloves and boots respectively.

Air Monitoring

Combined with the sense of smell and common sense, air monitoring should be conducted to ensure safety.

Characteristics of Field Instruments

To perform effectively in the field, air monitoring instruments must be:

a) portable

b) able to generate reliable and useful results.

c) sensitive and selective

d) intrinsically safe

All of these traits may or may not be present in any one insturment.

Identification & Verification of Spilled Products

It is important to test for the stability of a product to verify or identify its chemical and physical properties for safe response.

Method

Corrosive Risk

pH paper can be used to test for corrosive risk.

Flammability Risk

(Moving to a safe location) the pH paper can be ignited to determine flammability risk.

Oxidizer Risk

Starch paper (indicator strips) turn dark blue or black in the presence of an oxidizer.

Disposal

When assessing a category for disposal, keep it simple. Waste chemicals are not going to be used to do experiments, they are going into one of approximately ten categories for final disposition. If you don't know what category a waste is considered the following break down for disposal classification will help.

Basic Disposal Categories

A chemical can be subdivided into the following:

1) Organic or inorganic chemicals

2) Organic and inorganics arethen subdivided into:
   (a) liquid or solid

3) Then further subdivided into
   (a) reactive or non-reactive

4) Special categories for the following help to classify special waste products:
   (a) highly toxic e.g. Cyanide
   (b) air reactive e.g. Phosphorus
   (c) water active e.g. Sodium
   (d) biological or mutagenic
   (e) radioactive

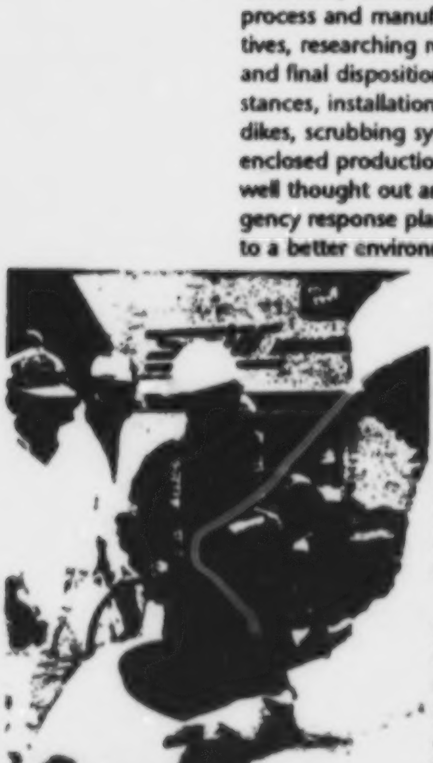
For safety and economics, wastes should be kept separate until advised by a knowledgeable person.

Never mix spilled products.

Spill management training: environmental insurance

In an age of growing environmental concern, the human race is faced with increasing responsibility for monitoring and reducing the amount of hazardous materials entering the environment.

Prudent selection of workplace chemicals, careful consideration of process and manufacturing alternatives, researching reuse, reclamation and final disposition of waste substances, installation of containment dikes, scrubbing systems, automated enclosed production systems, and a well thought out and practiced emergency response plan can all contribute to a better environment.



By tailoring on-site spill management training to meet potential risks and environmental conditions, an organization increases its capability to effectively respond to an accidental spill.

When a spill is managed well, the impact is reduced – and that in turn reduces the risk of employee injury, business interruptions, unlimited corporate liability, additional disposal and clean-up costs, as well as environmental problems.

Spill Management Inc.'s growth has been based on common sense – "Train The Worker." The people on the floor, on the line and in the field are the first ones who have to deal with a spill. By teaching them the basic objectives for responding to an environmental emergency they will be more confident in assessing the situation and acting to stabilize the spill.

An individual, aware of in-house policies and operations, potential risks in the workplace and trained in spill response countermeasures, can immediately evaluate the risks to life, property and the environment.

When an emergency response team arrives at the accident scene they must assess the incident and establish a safe procedure for dealing with a spill as quickly and thoroughly as possible.

Emergency responders, such as fire deparments, need reliable information as well as reference material, competent personnel, support services and experience to safely and effectively deal with an emergency.

Trained employees can provide critical information by indicating what type of material is involved, where countermeasures are placed, how effective they may be and what other preventive measures have been taken

REDUCE/page 2

Reduce risks

(contined from page 1)

to minimize or modify the potential impact.

When rescue and exit routes are to be determined, the employee can provide valuable caution information.

Unlike a fire situation, for example, you can't always see the hazard but the danger is real. The situation may escalate to the point where the workplace is evacuated, production is stopped, losses mount, or people are injured...perhaps because the worker didn't know how to implement countermeasures to slow the advancement of a spill, divert a spill to a more manageable area or contain the spill to stabilize the situation.

Training the worker does not minimize the seriousness of a hazardous material spill.

Knowing the chemical name of a spilled product does not disclose the true characteristics and dangers of the actual product to be stabilized. As products mix – and react – other substances or by-products may be formed, potentially leading to new substances and new circumstances.

But the competent worker, who works with a product on a day-to-day basis and is aware of the physical and chemical properties could be an important resource to emergency response personnel.

Employees can ensure an accident doesn't become a catastrophe

A succession of chemical spills and industrial accidents has made the worker aware of dangerous, poisonous and highly reactive chemicals in their work places. When an incident happens, initial response procedures and countermeasures must be quickly implemented. It is vital that those personnel who come in contact with hazardous materials should have practiced skills and procedures to minimize the loss of property, reduce the environmental impact and help the corporation maintain a positive corporate image.

'The Worker' in many cases, is the individual who may keep an accident from becoming a catastrophe.

An employee has many advantages over the initial response teams:

1) He/she has a working knowledge of the substance in question, including its exposure levels, hazards and specific risks.
2) Employees know the hazards in the work area that could cause consequential loss of life, property and environmental damage.
3) Employees can take advantage of the precious seconds to:
   - a) implement strategic counter measures
   - b) employ preventative measures to modify the potential risk
   - c) provide initial response teams detailed, accurate information.

After years of experience in responding to spills, Spill Management Inc. developed training programs that focus on teaching front-line employees effective, meaningful countermeasures. Spill Management Inc. not only understands the factors in effective spill response, but also the advantages a prepared worker, who can be instrumental in relaying key information to the initial response team, has in reducing the scope of a spill.

Years of practical experience in providing disposal services, waste treatment, and hazardous materials services gives Spill Management Inc. the expertise needed for effective countermeasures training. Fire departments, utilities, manufacturers, laboratories, warehouses, educational institutions, tank farms and transportation companies have all seen the need for training based on their exposures, work environment and limited resources.

Training for effectiveness

Training 'The Worker' ensures increased effectiveness and safety. A front line individual can immediately employ countermeasures to:

- Slow the advancement of a spill.
- Divert the spill to a more manageable area.
- Contain the spill close to its source.

The worker can also modify the hazard intensity (in the case of flammable vapor) by shutting off ignition sources, venting and securing the area.

He can report reliable, first-hand information to emergency response or support service teams.

Properly trained, they have critical advantages over emergency response personnel. They are:

- at the scene
- aware of risk-management and contingency plans
- familiar with both the products involved and the workplace environment and the potential hazards in a spill situation
- able to quickly access response supplies
- normally able to work ahead of the spill instead of chasing it.

A worker may be able to use temporary countermeasures to prevent an accident from becoming a catastrophe.

Our Clients/Trainees Include

Ontario Hydro
City of Nepean
Lambton College
Concordia University
McGill University
Ford Motor Company
Etobicoke Board of Education
Ontario Ministry of Environment
Philip Environmental Group
Environmental Training Institute
Connaught Laboratories Limited
Bradshaw-Leatherdale Fuels
Litton Systems Canada
Region of Halton
Hampsey Canada
Imperial Oil
Fire departments
National Defence

Specific Needs – Specific Training

Experience and expertise in disposal, response, hands-on training and matching response supplies to specific conditionss allows us to develop risk-management and contingency plans as well as site-specific training, that accurately reflects a company's risks and resources.

'Hands-on' training courses and workshops are based on our experience of the crucial first response period that makes the difference between a 'manageable incident' and a potential disaster.

Varied courses for varying requirements

All training is designed from TDC, NFPA, and NFC (revised 1990) guidelines as well as federal and provincial acts, regulations and provisions.

Our courses can be integrated into existing in-house OHSA or WHMIS training programs. An examination is performed before course certificates are presented.

Courses are designed to meet the specialized needs of:

- Certifying responders to recognized response standards.
- Municipal and Regional responses: hands-on exercises co-rdinate the responses of emergency, support and resource services.
- Hazardous Material Chemistry Course: helps non-technical personnel identify and verify known and unknown substances for response safety.
- Dealing with spills: from laboratory size spills up to large volume discharges of a thousand gallons per minute.
- Confined space entry.
- Working with sorbent materials.
- Decontamination.
- Drum handling techniques.
- Countermeasures to control liquid spills on land or in water ways.

Spill Management is:

Spill Management Inc. is a member of the Ontario Association of Fire Chiefs , The Canadian Association of Fire Chiefs and the U. S. National Fire Protection Association. The NFPA is internationally recognized for its definition of competency materials written for the safety of the individual, protecting life, property and the environment.

Cliff Holland has worked as a laborer, plant manager, marketing manager, trainer and responder in the waste management industry since 1980.

During this time he played an instrumental roll in helping to establish Canada's first transfer sites designated for laboratory-sized chemical waste; operating Central Ontario's first dewatering and fixation plant; negotiating Canada's first household hazardous waste day program in conjunction with the Region of Kitchener-Waterloo and the Ontario Ministry of the Environment.

His duties found him working in co-operation with municipal bomb squads in the pickup, transportation and disposal of shock-sensitive and unstable products.

Cliff also serves as a consultant-trainer for Lambton College's Safety and Environment program.

His awareness, knowledge and experience combine to produce a common-sense approach to hazardous material incidents.

The reality of success and failure

Countermeasures workshops are designed to make the individual face the reality of failure in preventing spills and the reality that success in minimizing spill damage comes from their initial response.

Workshops provide first response personnel with hands-on knowledge and experience that can be used to gain control of hazardous and non-hazardous spills.

The industrial courses are structured for the individuals who are aware of the various chemical and physical properties associated with the materials and products handled on a day-to-day basis.

The countermeasures practiced during the training sessions offer a common sense approach for slowing-down, diverting, containing and stabilizing spills. The exercises focus on the initial response period when confusion and uncertainty frustrate most response personnel.

Workshops deal with: effective methods of stabilizing spills; how to improvise controls when manpower, equipment and supplies are at a premium; and how to use sorbent materials as working tools.

Emergency Response Training Programs Designed for:

- Fire department personnel
- Warehouse personnel
- Manufacturing personnel
- Hydro personnel
- Laboratories
- Municipal works personnel
- Security guards
- Courier services
- Waste Management personnel
- Educational Insitutions
- OHSA officers
- Industrial environmental safety personnel
- Handlers, shippers and transporters of dangerous goods
- Contractors responding to dangerous goods incidents
- Others working with hazardous and non-hazardous goods which may create a negative impact on the environment

Site and product specific training

All training is done in the client's environment, addressing the specifics of: hazardous materials used or stored on site; location; climatic conditions; ground formations (clay, sand, rocks and gravel); design considerations and location of storage tanks, pipe lines, loading docks and other structures; and the resources and emergency response capabilities of other local agencies such as fire, police, works departments, and contractors.

For more information on spill management training and other environmental safety services, contact:

Cliff Holland

Spill MANAGEMENT INC.

Phone: (416) 578-9666
Fax: (416) 578-9666

53 Upper Mount Albion Road, Stoney Creek, Ont. L8G 3X4

SPILL RESPONSE AND SPILL RESPONSE EQUIPMENT

Merv Fingas, Chief, Emergencies Services Division
River Road Environmental Technology Centre, Environment Canada

AN OVERVIEW OF SPILL COUNTERMEASURES

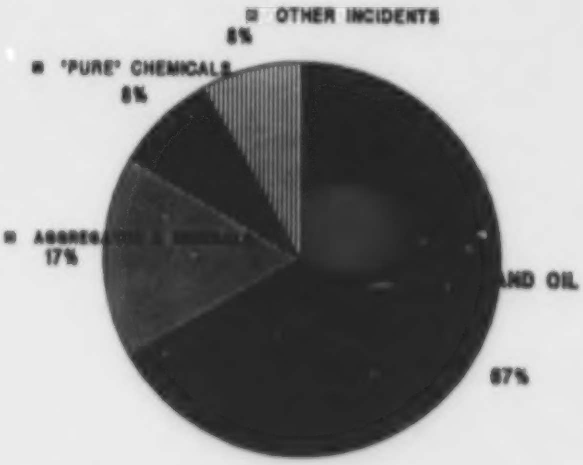
Merv Fingas
Emergencies Science Division
Environment Canada
Ottawa, Ontario

INTRODUCTION

Spills are as a complex topic and their cleanup can be equally as complex. Focus should always be on the behaviour of the individual substance or mixture that has been spilled. Countermeasures should minimize environmental damage that would result if the spill was not cleaned up. Focusing on the behaviour class or group simplifies the process and will result in better response to spills.

Spills at plant facilities are generally easier to control than those more remote. Appropriate equipment and resources are generally (or should be) on hand to control these spills. Spills become increasingly difficult to clean up as distance from equipment stockpiles increase. Response time also becomes a problem and with increasing response times there is an increasing cleanup problem. Recent efforts in developing stockpiles of equipment in remote locations along transportation routes will assist greatly in improving countermeasures in these regions.

Spills occur at a very frequent rate in Canada. About 12 spills are reported every day to the national spill data base.[1] Figure 1 illustrates the average breakdown of these spills. A few points must be made about the occurrence of spills; first, most spills are of oil and petroleum products, second, spills - on a national basis- are very frequent, and third, most chemical spills involve high volume industrial chemicals. The latter point is illustrated by Table 1 which shows the top priority chemicals and their relationship to spills.[2,3] A few chemicals account for a very significant portion of the spill volume and spill frequency. The supply volume listed in Table 1 is the sum of the production in Canada and the imports for each chemical in megatons. This table illustrates that spill volume and frequency are also highly correlated to the supply volume. In summary, one can be prepared for the most frequently-spilled chemicals and have a high probability of having resources best assigned. One additional point should be made, that of the relationship to sector. Only about 25% of the spills occur during transportation in the strictest sense. The majority of spills are from fixed facilities and during product transfers.



SPILL TYPES

FIGURE 1

AVERAGE PERCENTAGE OF EVENTS

Most of the spill problems can be handled by dealing with 4 common types:
1. Spills of liquids such as petroleum or hydrocarbon solids,
2. Spills of acids and bases,

ENVIRONMENT CANADA'S CHEMICAL SPILL PRIORITY LIST *

TABLE 1 CHEMICAL	RANK	SPILL NUMBERS	SPILL VOLUME	SUPPLY VOLUME	% NUMBERS	% VOLUME	% SUPPLY
Ammonia	1	107	470	3700	6.9	0.3	7.8
Chlorine	2	36	120	1700	9.2	0.4	11.4
Tetraethyl lead	3	4	72	26	9.5	0.5	11.5
Styrene	4	24	5000	630	11	4.2	12.8
PCBs	5	334	89		32.4	4.3	12.8
Sulfuric acid	6	155	13000	3700	42.3	13.9	20.6
Sodium cyanide	7	3	83	12	42.5	14	20.6
Hydrochloric acid	8	123	3300	170	50.4	16.4	21
Potassium chloride	9	31	12000		52.4	25.3	21
Pentachlorophenol	10	19	110	1.5	53.6	25.4	21
Phenol	11	10	14	68	54.2	25.4	21.1
Zinc sulfate	12	3	68	1500	54.4	25.5	24.3
Phosphorus	13	16	46	68	55.4	25.5	24.4
Toluene	14	13	110	430	56.2	25.6	25.3
Copper sulfate	15	5	23	24	56.5	25.6	25.4
Sodium chloride	16	12	1400	12000	57.3	26.6	50.7
Calcium chloride	17	20	3700	340	58.6	29.3	51.4
Sodium hydroxide	18	92	8200	1800	64.5	35.4	55.2
Sodium chlorate	19	23	7700	440	66	41.1	56.1
Ammonium sulfate	20	8	260	330	66.5	41.3	56.8
Ammonium hydroxide	21	15	130		67.5	41.4	56.8
Benzene	22	12	14	740	68.3	41.4	58.4
Xylene	23	14	47	290	69.2	41.4	59
Calcium hypochlorite	24	4	17	7.9	69.5	41.4	59
Formaldehyde	25	10	41	130	70.1	41.4	59.3
Acetic acid	26	9	73	71	70.7	41.5	59.4
Methyl alcohol	27	18	740		71.9	42	59.4
2,4-D	28	37	130	3	74.3	42.1	59.4
Ethylene dichloride	29	1	780	820	74.4	42.7	61.1
Ammonium nitrate	30	63	4200	910	78.4	45.8	63
Sulfur	31	68	70000	7400	82.8	97.5	78.6
Sodium carbonate	32	3	25	570	83	97.5	79.8
Ammonium phosphates	33	5	140	1400	83.3	97.6	82.8
Propylene oxide	34	2	22	61	83.4	97.6	82.9
Perchloroethylene	35	10	15	27	84	97.6	83
Calcium hydroxide	36	17	360	2600	85.1	97.9	88.5
Nonylphenol	37	2	8.8	7	85.2	97.9	88.5
Ethylbenzene	38	4	0.79	730	85.5	97.9	90
Ethylene glycol	39	31	590	410	87.5	98.3	90.9
Fenitrothion	40	49	100		90.6	98.4	90.9
Aminocarb	41	12	55		91.4	98.4	90.9
Carbon tetrachloride	42	1	1.8	26	91.5	98.4	91
Vinyl acetate	43	8	7.4	44	92	98.4	91.1
Sulfur dioxide	44	16	90	140	93	98.5	91.4
Nitric acid	45	48	140	890	96.1	98.6	93.3
Phosphamidon	46	8	16		96.6	98.6	93.3
Aldrin	47	2	1.3		96.7	98.6	93.3
Phosphoric acid	48	12	37	520	97.5	98.6	94.4
Ferric chloride	49	8	1000		98	99.3	94.4
Ethylhexanol	50	1	100		98.1	99.4	94.4
Hydrofluoric acid	51	5	0.68	77	98.4	99.4	94.6
Toluene-2,4-diisocyanate	52	7	2		98.8	99.4	94.6
Ethyl alcohol	53	3	51		99	99.4	94.6
Carbaryl	54	2	70		99.1	99.5	94.6
Parathion	55	1	0.01		99.2	99.5	94.6
Calcium oxide	56	12	530	2600	100	99.9	100
TOTAL OF ALL SPILLS		1558	135300.78	47413.4			

* *ONLY THE FIRST 56 OF THE 300 PRIORITY CHEMICALS ARE LISTED, % VALUES ARE CUMULATIVE PERCENTAGE OF TOTAL SPILL VOLUME IS IN TONS AND SUPPLY VOLUME IS THE SUM OF PRODUCTION AND IMPORTS IN MEGATONS*

3. Land and underground spills, and
4. Removal of chemicals from water.

These situations will be deal with in turn in this summary paper. Readers are advised to use some of the many good spill manuals and data sources available.[4-8] At least two independent sources should be consulted before making critical decisions.

SPILLS OF LIQUIDS SUCH AS PETROLEUM AND HYDROCARBON SOLVENTS

This category of spillage is the most frequent and accounts for about two-thirds of all spill incidents in Canada. The first issue in dealing with such spills is the flammability of the product. This must be considered in all phases of the spill control operation. Often special explosion-proof equipment must be used to prevent ignition. This is true for most spills of this category.

The first priority in any spill is to stop the source of leakage. The second priority is to contain the spill so that further environmental damage does not occur. On land this can be done quickly by building an earthen dyke: Other means include putting up physical or sorbent barriers. In winter, snow could be used as a last resort. The effectiveness of containment methods is a function of the quantity of material spilled. Extensive use of sorbents or sorbent containment devices can complicate spill cleanup in situations where the fluid can be recovered. The addition of the sorbent material expands the volume of material that must be disposed of.

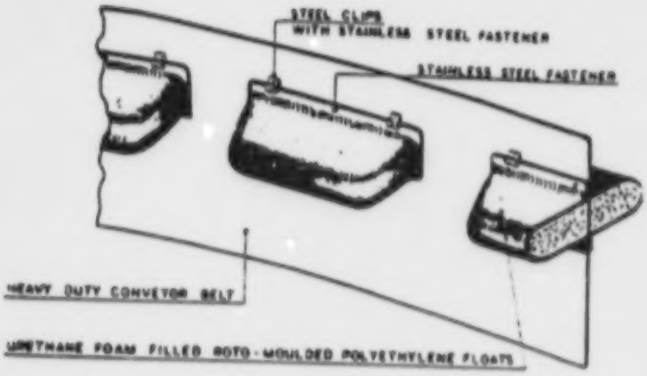
Spills on water can be contained using the many commercial spill containment booms. Figure 2 shows some of the many types available. Booms will contain floating liquids up to a relative speed of 3/4 knot. This is an important limitation because in many situations this velocity is exceeded. Attempts to contain oil directly across a river and across tidal bays will be futile. Tidal currents often exceed 2 knots and can be as much as 4 knots. Diversionary techniques can be used on rivers and other places where the current exceeds the 3/4 knot. By placing a boom at an angle with respect to the current, oil can be diverted from centre channel in currents as fast as 4 knots. This technique can be used to divert oil to a collection point along shore or an area of lesser environmental sensitivity.

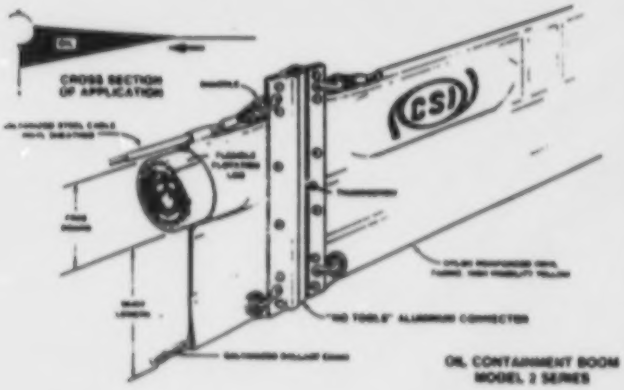
Many commercial booms exist and there does not exist significant differences between products. Booms made for higher-current containment will have two or more tension members so that the boom does not lie flat on the water, as a result of current forces.

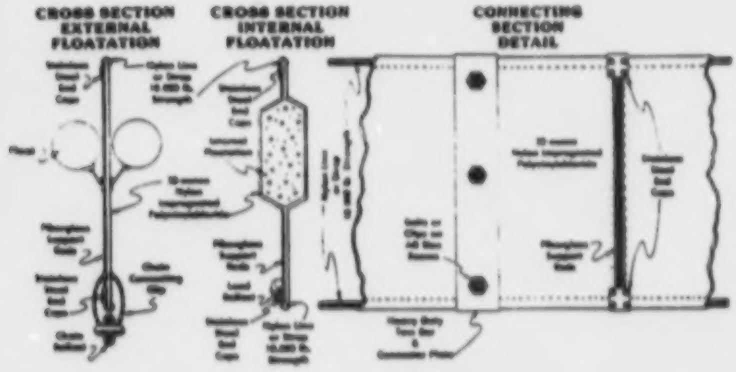
Once the petroleum or solvent is contained, the most usual means of recovery is to pump the liquid to a temporary storage facility. The most commonly-used conveyances are vacuum trucks. These are available in most locations and are generally used for sanitation purposes. Vacuum trucks offer few advantages other than being readily available and economical. The tanks also provide means of temporary storage and means of oil/water separation. Recovered water is often decanted from the truck before leaving the scene. Vacuum trucks are difficult to use on highly-volatile materials and may in fact be dangerous. Vacuum trucks have the advantage of being able to handle highly viscous material and can pass debris of sizes equivalent to their hose diameters. Some high performance vacuum trucks are available with large diameter hose (up to 18 inches) and with very high suction

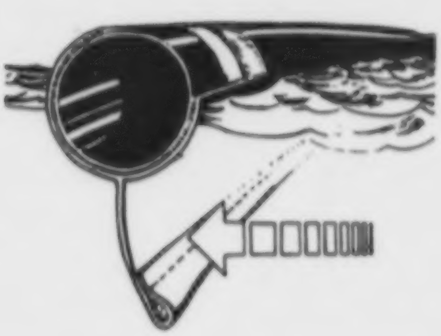
FIGURE 2

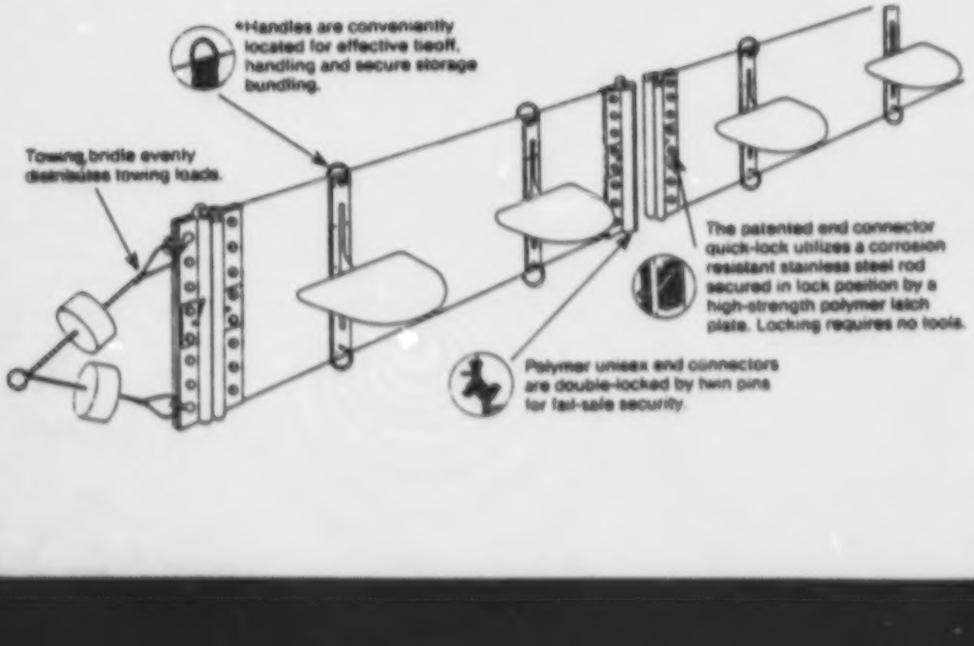
CONCEPTUAL DRAWINGS OF OIL SPILL BOOMS

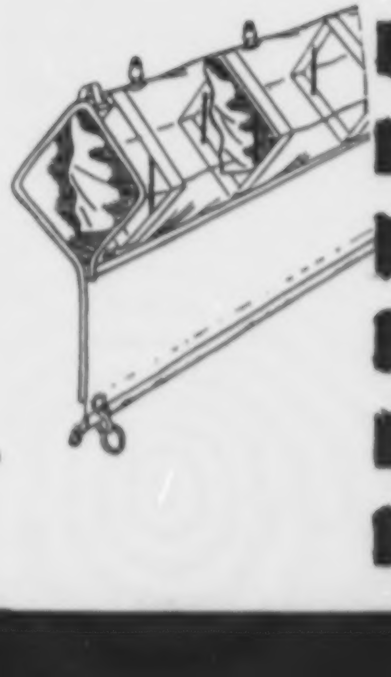

STEEL CLIPS
WITH STAINLESS STEEL FASTENER
STAINLESS STEEL FASTENER
HEAVY DUTY CONVEYOR BELT
URETHANE FOAM FILLED ROTO-MOULDED POLYETHYLENE FLOATS


CROSS SECTION
OF APPLICATION
CSI
"NO TOOLS" ALUMINUM CONNECTOR
OIL CONTAINMENT BOOM
MODEL 2 SERIES


CROSS SECTION
EXTERNAL
FLOATATION
CROSS SECTION
INTERNAL
FLOATATION
CONNECTING
SECTION
DETAIL




•Handles are conveniently located for effective tieoff, handling and secure storage bundling.
Towing bridle evenly distributes towing loads.
The patented end connector quick-lock utilizes a corrosion resistant stainless steel rod secured in lock position by a high-strength polymer latch plate. Locking requires no tools.
Polymer unisex end connectors are double-locked by twin pins for fail-safe security.



capabilities.

Typical pump configurations are illustrated in Figure 3. Explosion-proof pumps should be used for fuel spills. Positive-displacement pumps should be used for viscous materials. Many pumps are available commercially and many are also configured specially for spill recovery. Hoses compatible with special chemicals are also available. Environment Canada has prepared a catalogue of countermeasures equipment.[9] This lists the chemical compatibility of hoses, pumps and many other types of countermeasures equipment.

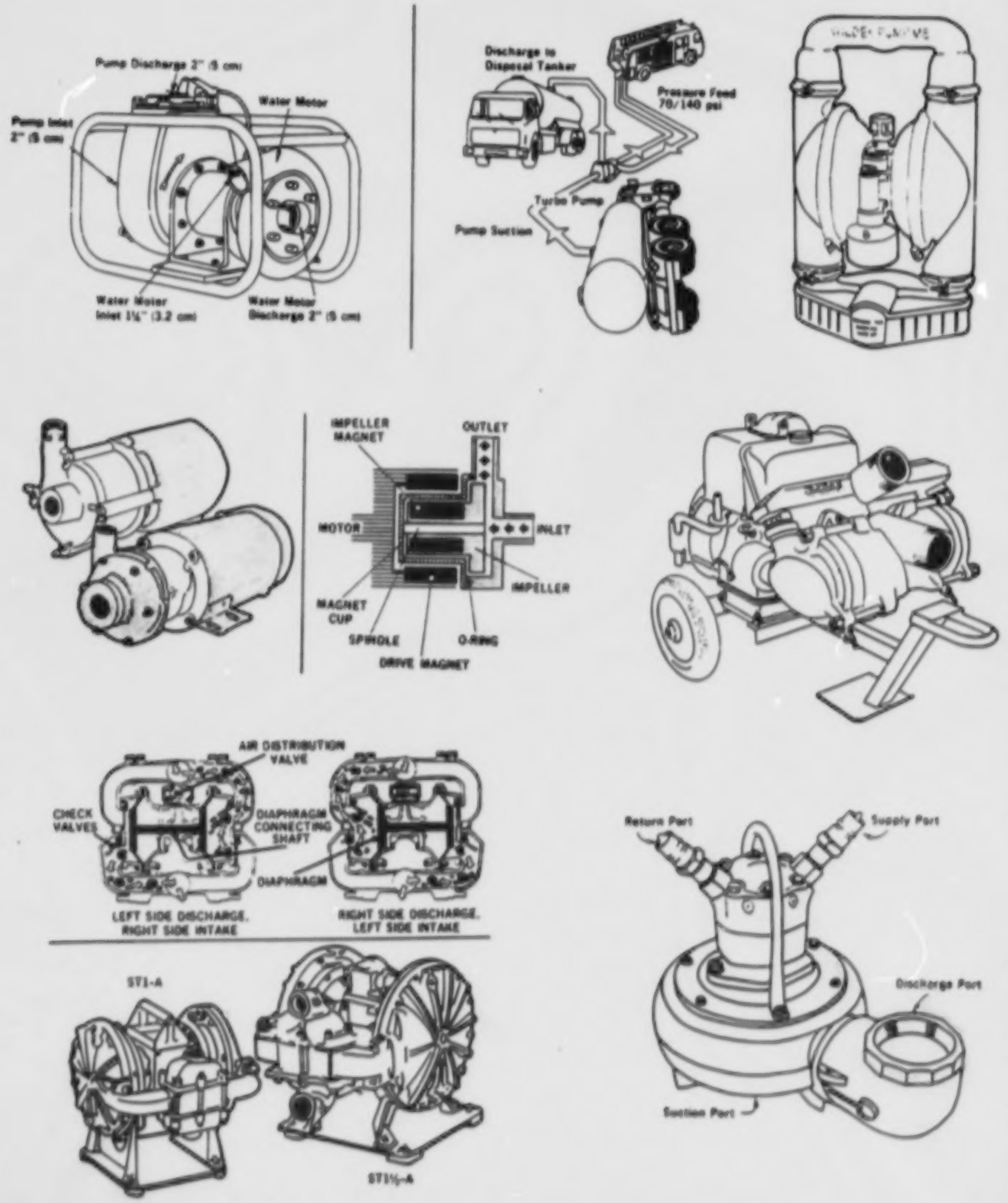
Sorbents are often used to cleanup petroleum and solvent spills. Large spills should not be cleaned up with sorbents as this creates a large amount of contaminated material for disposal. Furthermore, sorbents should not be used in cases where skimmers or pumps will be used because sorbents can jam or even completely negate the use of these devices. Sorbents are best used to "polish" or cleanup the final traces of the spill on water or on land. Sorbents used on water should not sink because this vastly increases environmental toxicity. Small spills on land can be readily cleaned up using sorbents. Many commercial sorbents are available. Table 2 lists the sorbent pick-up capacity of generic types of sorbents. Environment Canada countermeasures catalogue includes data on the chemical compatibility of sorbents. Several sorbents are designed specifically for recovering chemicals.

TABLE 2 SORBENT CAPACITIES

SORBENT TYPE	TYPICAL SORBENT CAPACITIES *(g oil/g sorbent)*	
	CRUDE OIL	BUNKER C
POLYURETHANE FOAM	20	35
POLYPROPYLENE PADS	15	20
ORGANIC FIBRE PAD	12	15
ABSORBENT BEADS	12	4
TREATED PEAT MOSS	5	8
TREATED WASTE PAPER	5	5
SAWDUST	4	10
PEAT MOSS	4	6
PERLITE	4	3
TREATED ZEOLITE	3	9
POM-POMS	2	15
WOOD CHIPS	2	3
CLAY	2	2
CORK	2	2

FIGURE 3

CONCEPTUAL DRAWINGS OF HAZ MAT PUMPS


Pump Discharge 2" (5 cm)
Water Motor
Pump Inlet 2" (5 cm)
Water Motor Inlet 1¼" (3.2 cm)
Water Motor Discharge 2" (5 cm)
Discharge to Disposal Tanker
Pressure Feed 70/140 psi
Turbo Pump
Pump Suction
WILDEN PUMPING
IMPELLER MAGNET
OUTLET
MOTOR
INLET
IMPELLER
MAGNET CUP
SPINDLE
O-RING
DRIVE MAGNET
AIR DISTRIBUTION VALVE
CHECK VALVES
DIAPHRAGM CONNECTING SHAFT
DIAPHRAGM
LEFT SIDE DISCHARGE, RIGHT SIDE INTAKE
RIGHT SIDE DISCHARGE, LEFT SIDE INTAKE
ST1-A
ST1½-A
Return Port
Supply Port
Discharge Port
Suction Port

Spills on water are often too thin to recover with pumps or suction devices. Special equipment known as skimmers has been developed to recover this material. Figure 4 illustrates the operating principles of several devices. Skimmers range in cost from a few thousand dollars to over a million dollars. The prime advantage of skimmers are they are able to recover the spilled liquid without recovering a large amount of water. This factor varies of course with the particular piece of equipment. Furthermore, skimmers are able to pick up thinner layers of material than is possible with suction devices. Skimmer require a technical expertise to operate and often are difficult to deploy. Many small spill coops do not have skimmers other than smaller suction heads.

Many treating agents are promoted to deal with oil and chemical spills. The first and most important point to make is that the acceptability and the use of spill treating agents is governed by Federal and in some cases, provincial legislation. Environment Canada has regulations governing the use of oil spill dispersants and similar treating agents and has interim guidelines on 18 other classes of spill treating agents. These regulations specify that a product to be listed must pass both effectiveness and toxicity tests. Once products are listed their use is limited to certain situations or specific permission is required before any use can take place. Regulations of this type are common in most countries. Many treating agents are promoted, most do more harm than good.

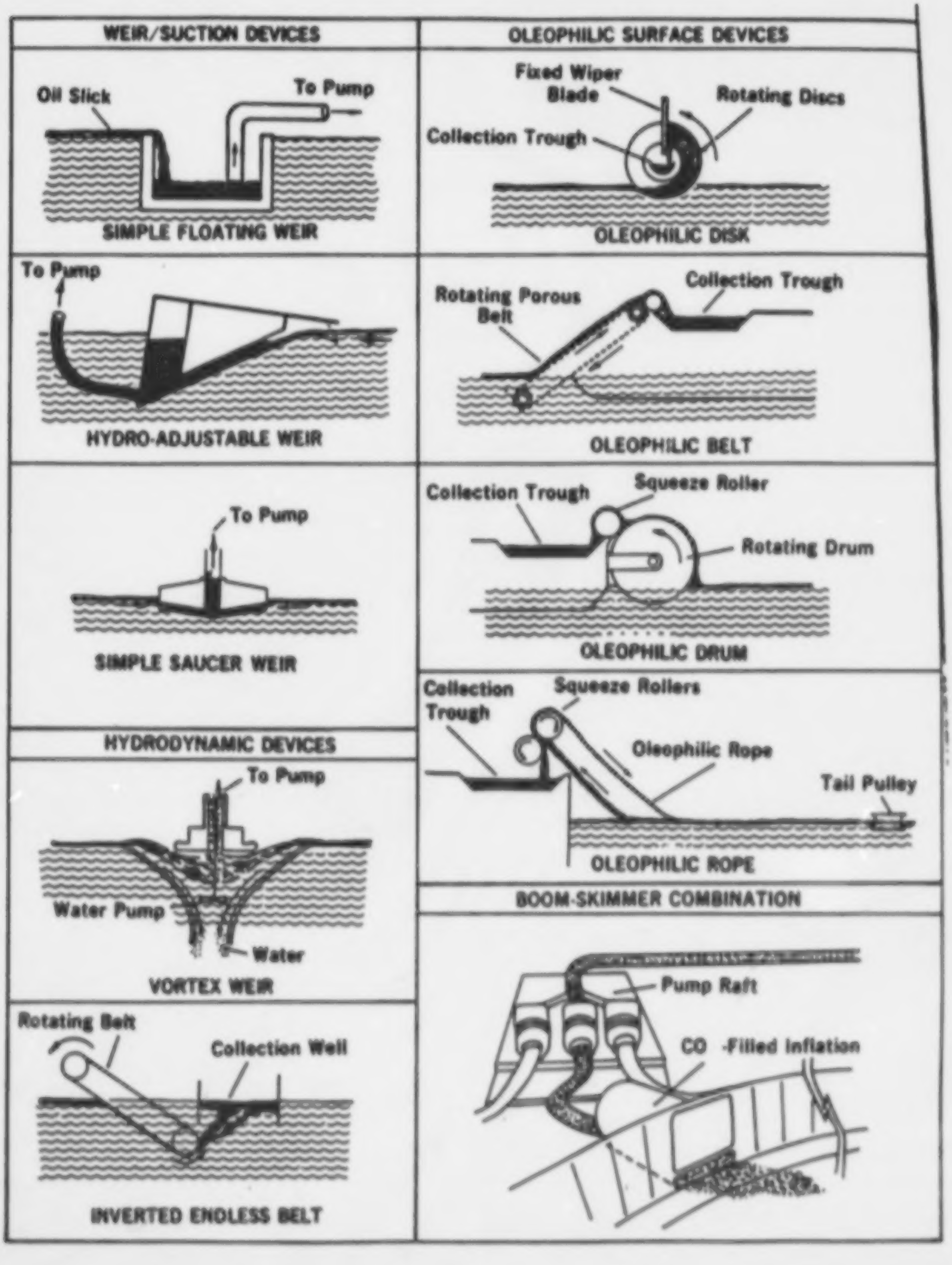
The most common types of treating agent are those containing surfactants or soap-like materials. Those intended to put oil or similar materials into the water column in the form of fine droplets are called dispersants. Dispersants are strictly controlled in Canada. [10] Only 8 products of the approximately 100 submitted have been approved for use. Specific permission to use dispersants is required from Environment Canada before such use. Dispersants are not extensively used in Canada and many other countries. The effectiveness of dispersants on heavy oils is limited. [11] Another class of surfactant-containing agents is surface-washing agents. These agents are used to remove oil from solid surfaces or from beaches. These agents are regulated under an interim guidelines and again specific permission to use these substances is required from Environment Canada. Only one agent of the about 50 submitted for testing has been approved for use in Canada. Neither these agents, nor dispersants, should ever be used on land spills. The net result of the use of surfactants is to drive the oil downwards toward the water table. Misuse of surfactants in this manner can easily make a thousand-dollar cleanup into a million-dollar problem.

The next most common agent sold for oil and solvent spills are solidifiers or gelling agents. These render a liquid contaminant solid. These agents are also regulated by Environment Canada, but only for acceptability. Solidifiers are not used as a matter of course because of numerous problems: first, they are expensive; a large ratio of solidifier to oil or solvent is required; the agents will also cause oil bonding to objects such as booms, and finally; solidifiers will completely solidify an oil unless a large amount of mixing is done.

The most popular agents at this point in time, are those agents known as biodegradation agents. Many of those being promoted are not biological agents or fertilizers, but are surfactants and other unrelated products. Because of the popularity of biodegradation many products purport to offer this solution. Only a few agents actually contain specially-cultured bacteria and have been found to be of use. Environment Canada is still developing tests for these agents, but preliminary testing had not shown great

FIGURE 4

CONCEPTUAL DRAWINGS FOR OIL SPILL SKIMMERS


WEIR/SUCTION DEVICES
Oil Slick
To Pump
SIMPLE FLOATING WEIR
To Pump
HYDRO-ADJUSTABLE WEIR
To Pump
SIMPLE SAUCER WEIR
HYDRODYNAMIC DEVICES
To Pump
Water Pump
Water
VORTEX WEIR
Rotating Belt
Collection Well
INVERTED ENDLESS BELT
OLEOPHILIC SURFACE DEVICES
Fixed Wiper Blade
Rotating Discs
Collection Trough
OLEOPHILIC DISK
Rotating Porous Belt
Collection Trough
OLEOPHILIC BELT
Collection Trough
Squeeze Roller
Rotating Drum
OLEOPHILIC DRUM
Collection Trough
Squeeze Rollers
Oleophilic Rope
Tail Pulley
OLEOPHILIC ROPE
BOOM-SKIMMER COMBINATION
Pump Raft
CO -Filled Inflation

potential, especially for crude and heavy oils which contain a large amount of degradation-resistant material. It should be remembered that tar is used for roofs and asphalt for roads because they are particularly resistant to degradation of many types.

Numerous other treating agents are offered, but most are not worth mentioning here. Only two agents other than those noted above have been approved for use by Environment Canada, one is a water-in-oil emulsion breaker, and the other is a recovery enhancer

A final word on disposal of recovered petroleum and hydrocarbon may be in order. Many companies specialize in re-cycled solvents and oils and have facilities to take these, provided they are not highly contaminated. Oils and pure hydrocarbons can be burned safely in more remote areas. Studies have shown that this burning is not especially harmful to the environment and can be an acceptable trade-off in many situations.[11] A number of companies have facilities for disposing of chlorinated and other solvents which are not entirely hydrocarbons. Lightly-contaminated soil or sorbent can be land-filled in many locations, given permission from local authorities.

SPILLS OF ACIDS AND BASES

Acids and bases constitute the second category of spill cleanups. The operative word for many such spills is that they must be neutralized as quickly as possible. Only if the spill is not threatening humans or the environment should it be left un-neutralized for recovery. In such cases, the priority is again to stop the leak, and then to contain the material before further spreading takes place. If the material is liquid, and the material can be safely contained and pumped, recovery should be attempted. neutralization can create a large disposal problem. Liquid acid and base spills can only be contained on land using material such as soil, sand or special sorbents. Once contained, special pumps and hoses must be used to recover the product. At all times, safety should be foremost and all precautions taken.

Neutralization must be done cautiously since large amounts of heat can be created by the chemical reaction. Acids are best neutralized with lime or soda ash. Use of a strong base to neutralize acid spills is dangerous and can increase environmental damage.[13] Similarly bases are best neutralized using a weak acid such as citric acid. Spills into water bodies should only be neutralized if the neutralizing material will be at the same location as the spilled material. In several instances, neutralization in water bodies has caused more damage than if left untreated because the neutralization agent missed the target and by itself caused damage.

Spill manuals should always be consulted to determine the specific dangers of the material spilled and the best cleanup methodologies.

LAND AND UNDERGROUND SPILLS

Most underground spills are of petroleum from storage tanks or connecting lines. Many spills, in fact most in Canada, occur on land. These will be dealt with separately in the following paragraphs.

Underground spills of petroleum or petroleum products are a major concern in North America at this time. Detection of such spill is often very difficult and in many cases goes on for years before discovery. Cleanup is expensive and difficult. The first priority for underground spills is to determine the source of the leak and stop further leakage. The second priority is to contain the spill into a small an area as possible. The most reliable way of doing this is to determine in which direction the plume of leaking material is going and its extent. The one tried and true method of doing this is to drill test holes and measure petroleum in these. Gasoline has a sufficiently low odour threshold that smell may be enough to determine its presence in a bore hole. More sophisticated detection methods may be required in other cases. Once the plume has been mapped, the most common method is to dig a trench to the water table at the front of the plume. This is known as an interceptor trench. A pump is use to remove the contaminant or a skimmer especially designed for this purpose. Given the right conditions, water can be pumped on the vicinity of the source to hasten the cleanup by 'flushing through' the contaminants. Other water purification methods such as those described below may be necessary to remove the contaminant from the water. The use of recovery wells rather than interceptor trenches may be necessary for deep plumes or for wide-spread contamination. Underground spills are a special problem and technical advice should be sought before proceeding. Several good books are available on the topic.[14,15]

Land spills of petroleum are very common. The first priority is to ensure that the spill does not infiltrate downwards toward the water table. This can be done by quickly recovering the liquid material, by lessening the permeability of the soil, by using water for example or by driving the liquid over to an impermeable area. Spills which penetrate deeply are much more costly and expensive to cleanup up. Surfactant agents should never be used on land spills, because they increase the downward penetration of the spilled material. Out-of-sight is not out-of-mind.

For both land and underground spills, contaminated soil may have to be removed for treatment. Despite numerous claims, no in-situ treatment techniques have proven to be either acceptable or effective. Other treating agents are no more than a passing fancy at this time. Soil washing techniques are now well-established and can be applied.[16] Other treatment technologies are becoming available as research progresses. Upon the approval of local environmental authorities, soil with certain contaminants can be land-filled.

REMOVAL OF CONTAMINANTS FROM WATER

Removal of spilled material from water is a subject unto itself. The Environment Canada catalogue on countermeasures lists several dozen different techniques or pieces of equipment.[9] Many publications cover the treatment of contaminated water and a data-base on the topic exists.[17,18] The topic will be dealt with here by focusing on the more commonly-applied and cheaper technologies. These will be considered by grouping the problem into four common treatment categories.

a. LOW-LEVEL ORGANICS - CARBON TREATMENT

Low-level contamination of water by organic substances is most commonly dealt with by using carbon treatment. Organics are generally absorbed into carbon at removal efficiencies of up to 99.9%. The removal effectiveness is relatively well-known and is dependent on the starting concentration and the contaminant. The data base noted earlier, lists known absorption efficiencies for substances and removal efficiencies obtained in experiments.[17] The carbon treatment technical is relatively inexpensive and very accessible, but has the disadvantage that the carbon must be disposed of.

b. HIGH-LEVEL ORGANICS AND INORGANICS - REVERSE OSMOSIS

Many materials are amenable to removal from water by reverse osmosis. The technique is relatively simple, contaminated water is applied to a membrane at high pressure. Contaminant molecules are too large to pass through holes in the membrane and are concentrated. Purer water passes through the membrane. Removal efficiencies up to 99% are possible, but the technique is only applicable to higher concentrations of contaminants. The method has some disadvantages: it is most applicable to high-molecular weight materials, compared to water; some pre-treatment may be required and filtration of particulate material is required before water contacts the membrane. Certain chemicals can attack the membrane or other components of the systems. The advantages of reverse osmosis are that the technique is becoming very common and widespread and thus accessible and that a large variety of materials can be processed. The cost is moderate compared to carbon treatment or other methodologies.

c. HIGH LEVEL ORGANICS - STEAM STRIPPING AND SOLVENT EXTRACTION

High levels of organic materials cannot be dealt with by some methods. Two newer methods have found success in removing high levels of organic materials, at least to the point where other methods can deal with these. These methods are steam stripping and solvent extraction.[19,20]

d. LOW-LEVEL METALS, INORGANIC CONTAMINANTS, RADIOACTIVES - ION EXCHANGE

Low levels of the named materials may be dealt with by using ion exchange columns. Appropriate columns to the application are chosen and the water is pumped through the column at rates between those specified by the manufacturer. The procedure is as simple as that for carbon column work. The columns can be regenerated in certain instances using special chemicals.[21] Very good concentrations can be achieved for some chemicals. Removal efficiencies varies with column and concentration but generally falls between 80 and 99.99%. Disadvantages include cost which is higher than for carbon columns, the limited applicability to ions other than those designed for, pH sensitivity and sensitivity to other pollutants present. Ion exchange offers unique potential for cleanup of certain compounds where other methods are not practical or completely unavailable.

ANCILLARY ITEMS

LEAK PATCHING

Leak patching is a very important facet of spill countermeasures. The best techniques at the moment are relatively simple ones as illustrated in Figure 5.[22] Several commercial kits are available to provide a wide-spectrum of capabilities. Kits for containing leaks in specialized containers are also available. Frequent users of one or two chemicals like chlorine are advised to purchase leak patching kits for their tanks. The availability of such leak-plugging capability can minimize the effects of a spills or prevent major consequences.

TEMPORARY STORAGE

Temporary storage will be required for a cleanup. Numerous portable tanks exist which can be used for many products. Specialized tanks are also available for highly corrosive or other dangerous materials. Sufficient storage for the expected cleanup should be available as past experience has shown that high volumes of water may be recovered with the spilled materials. Cleanup efficiency should not be hampered by lack of storage. Temporary arrangements can also be made by hiring vacuum trucks, tank trucks or even railway tank cars.

OTHER ISSUES

BIOREMEDIATION

Bioremediation is a fad at this time and there are many proponents of the technique and vendors of products claiming to aid in the process. Caution should be exercised in adopting any of these because bioremediation has only limited application to certain applications and is never as fast as hoped or needed. This is not to say that there is not place for bioremediation, but is a caution that bioremediation is vastly over-sold at this time and may in fact not be applicable to a number of spill situations.

SPILL TREATING AGENTS

Spill treating agents are very highly-promoted by manufacturers and many claims are made about their performance. Spill treating agents are regulated by Environment Canada. Guidelines exist both for their acceptability and their use. Acceptability is usually based on both toxicity and effectiveness. Many of the agents, once approved require specific permission before their use. Use of agents without approval can result in prosecution.

Cleanup personnel are advised not to believe claims of performance by vendors of such products. They are advised to inquire about the approval of the product by Environment Canada and request to see the test results. Of the about 300 agents submitted to Environment Canada for testing in the past 20 years, only 12 are currently acceptable for use. Many agents are toxic and many are completely ineffective.

SITUATIONS WHERE LITTLE CAN BE DONE

Many situations arise where there is little scope for countermeasures. Leaks of gaseous material is one case where this can arise. Such situations should be well-documented and special measures taken to prevent such.

This is a brief summary of some spill countermeasure highlights. Readers are advised to consult some of the references for further and detailed information.

REFERENCES

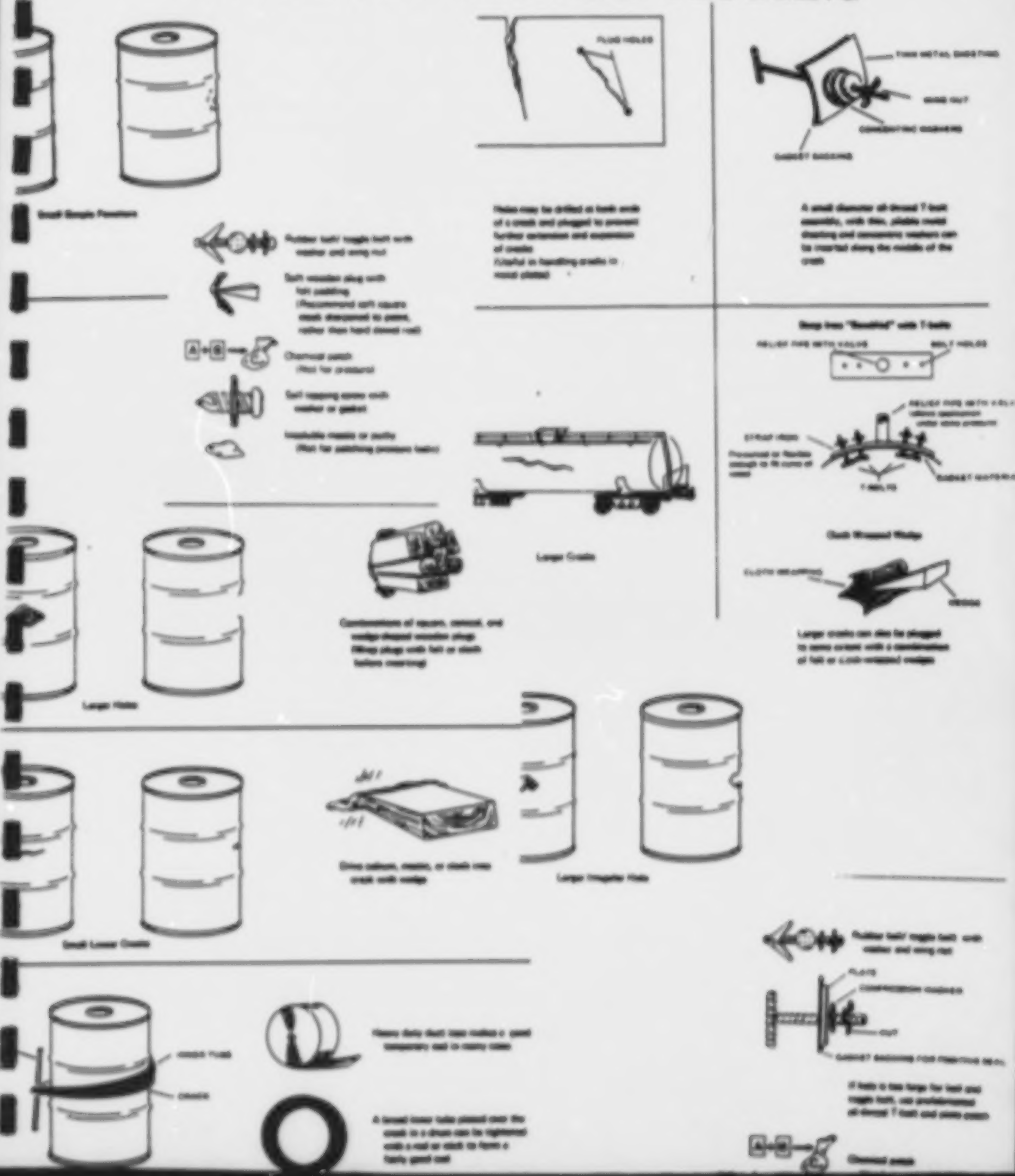
1. Cloutier, G., Private Communication, National Environmental Emergency Centre, January, 1991.

2. Beach, R.A., "Information Systems Used in Environmental Emergencies", *Spill Technology Newsletter, Vol. 3, No. 5*, pp. 283-287, 1978.

3. Fingas, M.F, N. Stone, D. LeBlanc, G. Sergy, B. Mansfield, G. Cloutier and P. Mazerolle, "Development of a New Chemical Spill Priority List", in *Proceedings of the Seventh Technical Seminar on Chemical Spills*, Environment Canada, Ottawa, Ontario, pp.

FIGURE 5

PROCEDURES FOR LEAK PLUGGING


PLUG HOLES
THIN METAL SHEETING
WING NUT
CONCENTRIC WASHERS
GASKET BACKING
RELIEF PIPE WITH VALVE
BOLT HOLES
STRAP IRON
T-BOLTS
GASKET MATERIAL
CLOTH WRAPPING
WEDGE
CRACK
COMPRESSION WASHER
NUT

Small Simple Punctures

Rubber bolt toggle bolt with washer and wing nut

Soft wooden plug with felt padding (Recommend soft square stock sharpened to point, rather than hard dowel rod)

Chemical patch (Not for pressure)

Self tapping screw with washer or gasket

Insoluble mastic or putty (Not for patching pressure leaks)

Holes may be drilled at both ends of a crack and plugged to prevent further extension and expansion of cracks (Useful in handling cracks in wood plates)

A small diameter all-thread T-bolt assembly, with thin, pliable metal sheeting and concentric washers can be inserted along the middle of the crack

Strap Iron "Bandaid" with T-bolts

Large Cracks

Cloth Wrapped Wedge

Large cracks can also be plugged to some extent with a combination of felt or cloth-wrapped wedges

Combinations of square, conical, and wedge-shaped wooden plugs (Wrap plugs with felt or cloth before inserting)

Large Holes

Drive cellulose, plastic, or cloth into crack with wedge

Large Irregular Hole

Small Linear Cracks

Rubber bolt toggle bolt with washer and wing nut

If hole is too large for bolt and toggle bolt, use professional all-thread T bolt and plate patch

Heavy duty duct tape makes a good temporary seal in many cases

A broad inner tube placed over the crack in a drum can be tightened with a rod or stick to form a fairly good seal

Chemical patch

103-108, 1990.

4. Fingas, M.F., J. DeGonzague and S. Lawrie, Manual For Spills of Hazardous Materials, Government of Canada Printing Office, Hull, Quebec, ISBN No. 0-662-13186-X, 314 p., 1984.

5. *Emergency Response Guide for Dangerous Goods*, Transport Canada, Ottawa, Ontario, 1982.

6 EnviroTips series - entitled "Chemical Name", Environmental and Technical For Problem Spills (EnviroTIPS), Government Publishing Centre, Hull, Quebec, ISBN 0-662-XXXXX, 1984 or 1985. EnviroTIPS manuals have been prepared for the following chemicals:

Acetic Acid
Acetic Anhydride
Ammonia
Ammonium Nitrate
Ammonium Phosphates
Benzene
Butyraldehydes
Calcium Chloride
Calcium oxide/hydroxide
Carbon Dioxide
Chlorine
Cyclohexane
Ethylbenzene
Ethylene
Ethylene Dichloride
Ethylene Glycol
Ethylene Oxide
2-Ethylhexanol
Ferric Chloride
Formaldehyde
Hydrogen Chloride/Hydrochloric Acid
Hydrogen Sulphide
Mercury
Hydrogen Fluoride/Hydrofluoric Acid
Methanol
Morpholine
Naphtha
Natural Gas
Nitric Acid
Phenol
Phosphoric Acid
Phosphorus
Potassium Chloride
Propylene
Propylene Oxide
Sodium Chlorate
Sodium Chloride
Sodium Hydroxide
Sodium Hypochlorite
Sodium Sulphate
Styrene
Sulphur Dioxide
Tetraethyl Lead
Toluene
Sulphuric Acid and Oleum
Urea
Vinyl Chloride
Xylenes
Zinc Sulphate
Sulphur

Note: These manuals vary from about 80 to 200 pages each

7 *Dangerous Goods Guide to Initial Emergency Response*, Transport Canada, Ottawa, Ontario, 1986.

8 *1987 Emergency Response Guidebook*, U.S. Department of Transportation, Washington, D.C., 1987.

9 Solsberg, L.B. and R.D.Parent, *A Survey of Chemical Spill Countermeasures*, Environment Canada Report number EPS 9/SP/2, Ottawa, Ontario, 1986.

10 Environment Canada, *Guidelines on the Use and Acceptability of Oil Spill dispersants*, Environment Canada Report Number EPS 1-EP-84-1, 1984.

11 Fingas, M.F., "Dispersants: A Review of Effectiveness Measures and Laboratory Physical Studies", in *Proceedings of The Alaska RRT Dispersant Workshop*, U.S. Minerals Management Service, Anchorage, Alaska, 37p., 1991.

12 Fingas, M.F. and N. Laroche, "A Review of the In-Situ Burning of Oil Spills", *Spill Technology Newsletter*, Vol. 15, No. 4, 1990.

13 Lamoreux, R., J. Duff, S. Colville, P. lane, M. Crowell, and J. Wright, *Follow-up Study Of A Sulphuric Acid Spill Near Springhill*, Nova Scotia, Environment Canada Manuscript Report Number EE-86, 1986.

14 Calabrese, E.J. and P. T. Kostecki, Editors, *Soils Contaminated by Petroleum*, John Wiley and sons, New York, 1988.

15 Calabrese, E.J. and P. T. Kostecki, Editors, *Petroleum Contaminated Soils, Volume 2*, Lewis Publishers, Chelsea, Michigan, 1989.

16 soil washing techniques

17 Environmental Protection Agency, *U.S. EPA Treatability Data Base*,Cincinnati, Ohio, 1991.

18 Freeman, H.M., *Physical Chemical Process: Innovative Hazardous Waste Treatment Technology Series*, Technomic Publishing Company, Lancaster, Pennsylvania, 1990.

19 Yau, H. and G. Giesbrecht, "Engineering a Mobile Steam Stripper", in *Proceedings of The Sixth Technical Seminar on Chemical Spills*, Environment Canada, Ottawa, Ontario, 1989.

20 Adams, C., D. Mackay and D. Rodriques, "Use of Pilot Scale Reciprocating Plate Extraction Column to Remove Organic Contaminants From Water", in *Proceedings of The Sixth Technical Seminar on Chemical Spills*, Environment Canada, Ottawa, Ontario, 1989.

21 Unterberg, W., R.W. Melvold, S.L. Davis, F.J. Stephens, and F.G. Bush, *How To Respond to Hazardous Chemical Spills*, Noyes Data Corporation, Park Ridge, New Jersey, 1988.

22 Cashman, J.R., *Hazardous Materials Emergencies*, Technomic Publishing Company, Lancaster, Pennsylvania, 1988.

NATIONAL CONTAMINATED SITES REMEDIATION PROGRAM

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FEDERAL SITES COMPONENT

NATIONAL CONTAMINATED SITES REMEDIATION PROGRAM

BACKGROUND

In April 1989, the Canadian Council of Ministers of the Environment (CCME) recognized the need for a consistent national approach, based on the "polluter pays" principle, for the ranking and clean-up of contaminated sites in Canada. The polluter pays principle suggests, that where the party (or parties) responsible for the contamination can be identified, that party will be held accountable for the costs of clean-up. CCME also recognized the need to provide government funds to clean-up high priority contaminated sites where the responsible party or owner cannot be identified or is financially unable to pay for the clean-up, and to stimulate the development of new and innovative clean-up technologies.

In response to these needs, CCME established the National Contaminated Sites Remediation Program (NCSRP) with the following objectives:

1. based on the polluter pays principle: to identify, assess and clean-up, in an effective and nationally consistent manner, all contaminated sites in Canada which are impacting or have the potential to adversely impact on human health or the environment;
2. to provide the necessary government funds to clean-up those "orphan" contaminated sites for which the responsible party cannot be identified or is financially unable to carry out the necessary work; and
3. to work with industry to stimulate the development and demonstration of new and innovative clean-up technologies.

In October 1989, CCME announced that they would be establishing a $250 million 5-year program to address the contaminated sites issue, based on a 50/50 federal/provincial cost sharing formula. The program will provide $200 million to clean-up high priority "orphan" contaminated sites and $50 million for clean-up technology development and demonstration. Each of the provinces and territories will have access to the federal portion of the cost-shared program in accordance with their respective population.

At the same time, CCME made a commitment to identify, assess and where required clean-up those contaminated sites which may have resulted from the activities of the federal, provincial or territorial governments.

FEDERAL SITES COMPONENT

The large amount of federal land in Canada will require a consistent and coordinated approach to ensure the identification of contaminated sites and the cost-effective management of clean-up activities. Environment

Canada has obtained Treasury Board approval to spend $25 million over the next five years starting in fiscal year 1990/91 to assist other federal government departments in addressing contaminated sites located on land for which they have custodian responsibility.

The Federal Sites Component of the National Contaminated Sites Remediation Program is a $25 million program to address contaminated sites located on land owned or operated by Federal Government custodian departments, boards or agencies.

CONTAMINATED SITES

What constitutes a contaminated site? Contaminated land sites are areas contaminated by toxic and hazardous substances at levels which pose existing or imminent threats to human health or the environment. These sites often pose multi-faceted health and environmental problems; they can impact all components of the environment, particularly surface waters, soils and groundwater. In addition, because all sites have not yet been identified, there may be situations where people are unknowingly being exposed to toxic substances. Contaminated sites may include production areas, landfills, dumps, places where waste has accumulated, waste storage and treatment sites, mine tailings, spill sites, chemical waste handling and storage sites, and they may be located in residential, commercial, industrial, rural, urban or wilderness areas.

SITES WHICH REQUIRE FURTHER STUDY

How many contaminated land sites in Canada are the responsibility of the federal Government? The exact number is currently unknown. In order to get a better feel for the scope of the federal problem, a list of sites which require further study is being developed. The "sites which require further study" designation is being used because until actual assessment activities take place at the particular site in question one cannot say with certainty that the sites are contaminated as previously defined.

The list will be utilized by the custodian departments along with Environment Canada to develop a sense of the scope of the problem and the extent of contamination at sites across the country. Then in consultation with the custodian department, a national priority for detail assessment and remediation activity will be assigned to each site. In this manner it is hoped that the $25 million fund will be utilized in a cost effective manner so that the suspected highly contaminated sites are first in line for assessment or remediation activity.

In Ontario, the Department of Public Works has been contracted by Environment Canada to develop this list. Appendix 1 is a questionnaire relative to the data gathering exercise.

PRINCIPLES OF FUNDING

The Federal Sites Component was established when Treasury Board provided to Environment Canada $25 million to assist other federal government departments in addressing contaminated sites located on land for which they have custodian responsibility. Environment Canada is acting as a facilitor in getting these funds to the federal government contaminated sites which are most in need based on contamination present.

To have a common playing field for distribution of the funds, Principles of Funding were developed for the Federal Sites Component. The Principles of Funding are:

1. The "Polluter Pays Principle" applies to all site remediation activities.
2. Custodian departments are responsible for the identification, assessment and the development of remedial measures as required.
3. The custodian department is responsible for securing the necessary funding for all assessment and clean-up activities. Application to fundings through 5 below must be made by the custodian department.
4. Access to the Federal Sites Component of the National Contaminated Sites Remediation Program is available to federal government departments, boards and agencies with the exception of Schedule III Crown Corporations.
5. The Federal Sites Component funding is subject to the following conditions:
    a. Site assessment to be cost shared on a 50/50 basis with the custodian department(s), boards and agencies. (Estimated costs $10 million).
    b. Remediation action at priority (high-risk) sites where ownership is not clear or is shared with other departments, boards, agencies or governments. The cost of all remedial activities will be shared on an equitable basis between the responsible parties. The share provided by the Federal Sites component will not exceed 50% of the agreed remedial costs. (Estimated costs $15 million).

6. The National Contaminated Sites Remediation Program will establish a National Classification System and National Remediation Criteria for all contaminated sites including federal sites.

ASSESSMENT

As stated in the Principles of Funding, site assessment activities will be cost shared on a 50/50 basis with the custodian department, board or agency. Identification of sites where assessment activities could take place is the responsibility of the custodian department, board or agency. On request, Environment Canada can provide assistance to the custodian department concerning the suitability of a proposed site. Consultations between custodian departments and Environment Canada are in progress concerning proposals for site assessment initiatives. The assessments will be phased over the remaining four year time schedule for the program.

REMEDIATION

As stated in the Principles of Funding, funding for remediation or cleanup action is applicable at priority sites where ownership is not clear or is shared with other departments, boards, agencies or governments. The cost of all cleanup activities will be on an equitable basis between the responsible parties. Environment Canada is currently developing a process for site selection for site remediation activity. Site remediation is a very costly undertaking. For example, a site in Quebec recently cost over $4.4 million to cleanup and an estimate of $10.3 million has been made to cleanup another site. The sites selected for remediation must be the highest priority and provide the most benefit from the budget available.

NATIONAL CLASSIFICATION SYSTEM FOR CONTAMINATED SITES

The Canadian Council of Ministers of the Environment (CCME) on establishment of the National Contaminated Sites Remediation Program (NCSRP) recognized the need for consistency in the overall management of the program. CCME requested the National Classification System be developed to establish a rational and scientifically-defensible system for comparable assessment of contaminated sites across Canada, and to provide a national consistency in the overall implementation of the National Contaminated Sites Remediation Program.

The National Classification System was developed through consultation with government (Federal and Provincial), industry and the public. It is based on a review of existing provincial, territorial and international methods for classifying sites. Its purpose is to provide scientific and technical assistance in the identification of sites which may be considered high, medium or low risk. The system classifies contaminated sites into general categories of concern (Class 1, 2 or 3) in a systematic and rational manner, according to their current or potential adverse impact on human health or the environment.

The National Classification System was designed to be one tool to aid in the evaluation of contaminated sites. It does not take into account issues of technology, socioeconomic, political or legal to classify a site. This system is applicable to all federal contaminated sites. Custodian departments must ensure that this system is employed to identify the classification of their sites.

Details on the use of the National Classification System can be obtained from the Water Quality Branch of Environment Canada.

INTERIM CCME ENVIRONMENTAL QUALITY CRITERIA FOR CONTAMINATED SITES

Prior to commencing remediation or cleanup activities at a site, remediation criteria must be available. The Canadian Council of Ministers of the Environment recognized the need for nationally consistent remediation criteria. Other countries such as Great Britain, Netherlands, Norway, USA and Germany have developed their own remediation guidelines or criteria. But their respective criteria vary widely depending on need and viewpoint. In Canada, provinces such as British Columbia, Ontario, Alberta and Quebec have guidelines for clean-up of contaminated industrial sites. These guidelines also vary from one jurisdiction to another. The Interim Environmental Quality Criteria for Contaminated Sites provides the national consistency.

These Interim Environmental Quality Criteria are numerical limits or narrative statements intended to protect, maintain or improve current and future use of soil and water at contaminated sites. The future uses of soil and water are in reference to agricultural, residential/ parkland, and commercial/industrial land use. The interim criteria include the Canadian Water Quality Guidelines (CCME, 1987) and Guidelines for Canadian Drinking Water Quality (HWC, 1989).

Many of the interim criteria do not have complete supporting rationale and are therefore considered interim until validated criteria for use in the National Contaminated Site Remediation Program are produced. However, the interim criteria provide a working set of values that appear to provide an adequate degree of human and environmental protection based on experience and professional judgment.

Details on the use of the Interim Environmental Quality Criteria for Contaminated Sites can be obtained from the Water Quality Branch of Environment Canada.

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LIST OF
FEDERAL FACILITIES

GENERAL "Facility" INFORMATION
(To be completed for each "facility" having at least one site)

1. Date of information (Facility) (yy/mm/dd) :
2. Facility LDU number: (from PW property inventory system)
3. Facility: (o)wned/(l)eased: ☐
4. Occupant : a) Custodian : (Optional Code)
   b) Operator : (Optional Code)
   c) Operator Private (specify) :
5. Facility Name :
   Address
6. City :
7. Province :
8. Postal Code: -
9. Latitude: ° ' "
   Longitude: ° ' "

*****Facility contact*****

10. Name
    Title
    Phone ( ) -
    Fax ( ) -

*****Optional information*****

	CODE	NAME (if code unknown)
Region :		
District :		
County :		
Constituency :		

Page ☐☐ of ☐☐

LIST OF FEDERAL FACILITIES

GENERAL "Site" INFORMATION
(To be completed for each "site" in facility)

1. Date of information (Site) (yy/mm/dd) : ☐☐ ☐☐ ☐☐

If different from facility or from previous site:

4. Occupant (Site) a) Custodian : (Optional Code)
b) Operator : (Optional Code)
c) Operator Private (Specify) :

10. Contact Name
Title
Address :

Phone ( ) -
Fax ( ) -

11. Site name/location:

***** Use check mark (✓) to designate selection(s) *****

12. Site Usage:

01 ☐ Industrial Site (e.g. coal gasification plants)
02 ☐ Mine Tailings Site
03 ☐ Municipal Landfill Site
04 ☐ Hazardous Waste Landfill Site
05 ☐ Spill Site
06 ☐ Leaking Underground Storage Tank
07 ☐ Chemical Waste Handling/Storage Site
08 ☐ Dredged Material Disposal Site
09 ☐ Contaminated Sediments (harbour or river)
00 ☐ Unknown
99 ☐ Miscellaneous (Specify)

13. Contaminants on Site:

999 ☐ Industrial waste - inorganic
998 ☐ Industrial non-halogenated organics
997 ☐ Industrial halogenated organics
996 ☐ Biomedical waste
995 ☐ Pesticides
994 ☐ Petroleum products
993 ☐ Incinerator ash
992 ☐ Laboratory waste
991 ☐ Radioactive waste
000 ☐ Unknown
990 ☐ Other (Specify)

14. Site Rating: 1 - high 2 - medium 3 - low U - undetermined P - high (based on public profile)

15. Source of Contaminants: 1 ☐ onsite 2 ☐ offsite 3 ☐ both

16. Media Affected:1 ☐ soil 2 ☐ groundwater 3 ☐ surface water 4 ☐ sediments 5 ☐ air 6 ☐ contained

17. Area contaminated (sq. meters):
Volume contaminated (cu. meters):

18. Site status: A ☐ active C ☐ closed

Page ☐☐ of ☐☐

LIST OF FEDERAL FACILITIES

19. Calendar of site action: (enter date yy/mm/dd)

☐☐ / ☐☐ / ☐☐ - site entered in inventory
☐☐ / ☐☐ / ☐☐ - initial assessment initiated
☐☐ / ☐☐ / ☐☐ - initial assessment completed
☐☐ / ☐☐ / ☐☐ - detailed assessment initiated
☐☐ / ☐☐ / ☐☐ - detailed assessment completed
☐☐ / ☐☐ / ☐☐ - remedial action initiated
☐☐ / ☐☐ / ☐☐ - remedial action completed
☐☐ / ☐☐ / ☐☐ - effectiveness of corrective measures verified
☐☐ / ☐☐ / ☐☐ - site deleted from inventory

20. Comments:

LIST OF FEDERAL FACILITIES

EXPLANATION OF FIELD NAMES

1. DATE OF INFORMATION

This is to keep track of any data changes on the inventory as a result of information update. Entry is done separately for the "facility" dataset and for the "site" dataset. Use the format yy/mm/dd.

2. FACILITY ID

This will be a unique number based on what is developed and used by Public Works Canada for the identity of a federal facility, known as the Land Development Unit (LDU) number. It would be maintained here to serve as a key linkage to the FFEAD (Federal Facilities Environmental Activities Database).

3. FACILITY OWNERSHIP

Use O if it is government-owned and L if it is leased to a government department.

4. OCCUPANT CODE

Use the corresponding code for the facility (or site) Custodian and Operator department, agency, board or Crown Corporation:

AGR - Agriculture Canada
COR - Correctional Services
EMR - Energy, Mines and Resources Canada
DOE - Environment Canada
F&O - Fisheries and Oceans Canada
FOR - Forestry Canada
HWC - Health & Welfare Canada
INA - Indian & Northern Affairs Canada
DND - National Defence
PWC - Public Works Canada
RCMP - Royal Canadian Mounted Police
SSS - Supply & Services of Canada
DOT - Transport Canada
VAC - Veteran Affairs Canada

Additional codes can be added later based on the listings from the Government of Canada Telephone Directory.

If operator is a private company (e.g. oil company on a DOT airport facility), specify the company name.

Optional Code: Future coding to be utilized for identification of Occupant Region, Service or Branch.

5. FACILITY NAME AND ADDRESS

Self-explanatory item.

6. CITY/COUNTY IN WHICH FACILITY LOCATED

Self-explanatory item.

7. PROVINCE/TERRITORY IN WHICH FACILITY LOCATED

Use the following provincial/territorial codes:

NFLD - Newfoundland
PEI - Prince Edward Island
NS - Nova Scotia
NB - New Brunswick
QUE - Quebec
ONT - Ontario
MAN - Manitoba
SASK - Saskatchewan
ALTA - Alberta
BC - British Columbia
YT - Yukon
NWT - Northwest Territories

8. POSTAL CODE AT WHICH FACILITY LOCATED

Self-explanatory item.

9. LATITUDE/LONGITUDE OF FACILITY

Record the degrees, the minutes, and if possible, the seconds for each facility.

10. FACILITY CONTACT

Record the name, title or designation, phone number, and fax number of the contact person at the facility level associated with the operator department. This information will be required to enter again in the site dataset if the site contact person is diffferent.

11. SITE NAME/LOCATION

Use the description that the government officials and the public are familiar with.

12. SITE USAGE

Use the following codes to provide an indication of how the site has been utilized and the origin of potential contaminants of the site.

01 - Industrial Site (e.g. coal gasification plants)
02 - Mine Tailings Site
03 - Municipal Wastes Disposal Site
04 - Hazardous Waste Landfill Site
05 - Spill Site
06 - Leaking Underground Storage Tank
07 - Chemical Waste Handling/Storage Site
08 - Dredged Material Disposal Site
09 - Contaminated Sediments (Harbour or River)
99 - Miscellaneous (Specify)
00 - Unknown

Additional codes can be added later if appropriate.

13. CONTAMINANTS ON SITE (GENERAL CATEGORIES OF CONTAMINANTS)

Use the following codes to identify categories of potential contaminants at the site.

999 - Industrial waste - inorganic
998 - Industrial non-halogenated organics
997 - Industrial halogenated organics
996 - Biomedical waste
995 - Pesticides
994 - Petroleum products
993 - Incinerator ash
992 - Laboratory waste
991 - Radioactive waste
990 - Other (Specify)
000 - Unknown

Additional codes can be added later if appropriate.

14. **SITE RATING**

1 - Class 1 risk site based on national classification system
2 - Class 2 risk site based on national classification system
3 - Class 3 risk site based on national classification system
P - high risk site based on public profile
U - undetermined/unknown risk site

These may be modified to suit the yet-to-be established national classification format.

15. **SOURCE OF CONTAMINANTS**

Use the following codes:

1 - On-Site
2 - Off-Site
3 - Both on-site and off-site

16. **MEDIA AFFECTED**

Use the following codes:

1 - Soil
2 - Groundwater
3 - Surface Water
4 - Sediments
5 - Air
6 - Contained (contaminant in approved containment)

Additional codes will be added later for any possible combination.

17. **AREA AND VOLUME CONTAMINATED**

Provide data to this information item in square metres for area and cubic metres for volume.

18. **SITE STATUS**

A - Active (still operating)
C - Closed or Inactive (not operating)

Additional codes can be added later if required.

19. CALENDER OF SITE ACTION

Enter the appropriate date in yy/mm/dd for each of the following actions concerning the site:

- site entered in inventory
- initial assessment initiated
- initial assessment completed
- detailed assessment initiated
- detailed assessment completed
- remedial action initiated
- remedial action completed
- effectiveness of corrective measures verified
- site deleted from inventory

20. COMMENTS

Add any relevant information if desired. e.g remedial technology used at the site, time period of site usage.

February 1, 1991

FEDERAL SITES COMPONENT
OF THE
NATIONAL CONTAMINATED SITES
REMEDIATION PROGRAM

PRINCIPLES OF FUNDING

- POLLUTER PAYS PRINCIPLE
- OGD's, BOARDS/AGENCIES
- SCHEDULE III CROWN CORPORATIONS EXCLUDED
- 50% SITE ASSESSMENT COSTS
- UP TO 50% REMEDIATION COSTS
- USE NATIONAL CLASSIFICATION SYSTEM AND INTERIM CCME ENVIRONMENTAL QUALITY CRITERIA

SESSION 4

UNDERGROUND STORAGE TANKS

Moderator: Asit K. Hazara, Chief, Federal Activities Division,
Federal Programs Branch, Environment Canada

THE ENVIRONMENTAL CODE OF PRACTICE FOR UNDERGROUND STORAGE TANKS

Kelly Karr, Program Engineer, Oil,Gas and Energy Division
Conservation and Protection, Environment Canada

(Environmental Code of Practice for Underground Storage Tanks
Containing Petroleum Products, 1989)

ENVIRONMENTAL CODE OF PRACTICE

FOR UNDERGROUND STORAGE TANK SYSTEMS CONTAINING PETROLEUM PRODUCTS

1989

Revised Edition

Issued by the
National Task Force on Leaking
Storage Tanks for the
Canadian Council of Resource
and Environment Ministers

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Preface

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[illegible]

The National Task Force on Leaking Storage Tanks

Phase I — Underground Storage Tanks Containing Petroleum Products

[illegible]	British Columbia Fire Commissioner's Office
[illegible]	Northwest Territories Fire Marshal's Office
[illegible]	Alberta Fire Prevention Branch
[illegible]	Alberta Environment
[illegible]	Saskatchewan Environment and Public Safety
[illegible]	Underwriters' Laboratories of Canada
[illegible]	Environment Canada
[illegible]*	Ontario Fuel Safety Branch
[illegible] (Chairman)	Environment Canada
[illegible]*	Newfoundland Dept. of the Environment
[illegible]	Newfoundland Dept. of the Environment
[illegible]	Manitoba Dept. of Environment and Workplace Safety and Health
[illegible]	Yukon Fire Marshal's Office
[illegible]	Ontario Ministry of Environment
[illegible]	Prince Edward Island Dept. of Community and Cultural Affairs
[illegible]	Ontario Fire Marshal's Office
[illegible] (Coordinator)	Environment Canada
[illegible]	British Columbia Ministry of Environment
[illegible]*	Petroleum Association for the Conservation of the Canadian Environment
[illegible]	Petroleum Association for the Conservation of the Canadian Environment
[illegible]	National Automotive Trades Association
[illegible]	Petroleum Association for the Conservation of the Canadian Environment
[illegible]	National Research Council Codes Section
[illegible]	Ontario Fuel Safety Branch
[illegible]	Department of Fisheries and Oceans
[illegible]	Underwriters' Laboratories of Canada
[illegible]	Quebec Ministry of Energy and Resources
[illegible]	[illegible]
[illegible]*	Nova Scotia Dept. of Environment
[illegible]*	Quebec Ministry of Energy and Resources
[illegible]	New Brunswick Dept. of Municipal Affairs and Environment
[illegible]	Department of National Defence

Corresponding Members

[illegible]	British Columbia Ministry of Environment
[illegible]	Northwest Territories Dept. of Renewable Resources
[illegible]	Transport Canada
[illegible]	Public Works Canada

*Resigned from the National Task Force prior to completion of the Environmental Code.

Rationale for an Environmental Code of Practice

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

A Guide to the Use of the Code

Purpose

The Environmental Code presents minimum requirements to protect the environment from existing or new or proposed *underground storage tank systems* that contain *petroleum products*. Its primary purpose is the promotion of environmentally sound management of underground *petroleum product storage tank* systems through the application of uniform performance standards throughout Canada.

Relation to other codes

The Environmental Code of Practice for Underground Storage Tank Systems Containing Petroleum Products is written as a complimentary document to the National Fire Code of Canada and to part of CSA Standard B139, Installation Code for Oil Burning Equipment.

National Fire Code of Canada (NFC)

The Environmental Code has been developed in coordination with the National Research Council, author of the National Fire Code of Canada, to minimize the possibility of conflict between the respective contents of the two codes.

While the Environmental Code provides minimum requirements for the prevention of *petroleum product* losses from *underground storage tank systems* that may lead to environmental problems (primarily groundwater contamination), the NFC sets technical requirements for the storage and *handling* of *flammable and combustible liquids* from the point of view of preventing fires or explosive hazards.

In order to ensure effective application, fire officials, environmental officials or other authorities having the jurisdiction to regulate underground *petroleum products storage tanks* should be fully conversant with the technical requirements in both codes. This is the only way to ensure that *underground storage tanks* are built, installed, operated and removed in a manner that is *acceptable* from both a fire safety and environmental point of view.

CSA Standard B139, Installation Code for Oil Burning Equipment

Certain provisions of CSA Standard B139 are referenced in the Environmental Code. However, since the CSA Standard B139 has not been revised since 1976, in certain respects it is out of date with current recommended practices. Where the two codes conflict with one another it is intended that this Environmental Code shall govern.

Structure and Content

The Code is drafted in such a way that it may be adopted or enacted for legal use by any jurisdictional authority in Canada.

A decimal numbering system similar to the National Fire Code has been used throughout the Environmental Code. The first number indicates the Part of the Code, the second the Section within the Part, the third the Article within the Section. An Article may be broken down further into sentences, clauses and subclauses, each of which, as can be seen below, is in parentheses.

4	Part
4.5	Section
4.5.1	Article
4.5.1(1)	Sentence
4.5.1(1)(e)	Clause
4.5.1(1)(e)(i)	Subclause

A summary of the contents of the Environmental Codes follows.

Part 1 Application and Definitions

Part 1 defines terms and stipulates how the Environmental Code is applied. It includes the necessary administrative details to ensure that the technical requirements can be applied with a minimum of difficulty.

Part 2 Registration of Underground Storage Tank Systems

This part contains requirements for the registration of *underground storage tank systems*. It includes the scope of the tank systems that are required to be registered as well as provisions respecting *storage tank* system identification and *petroleum product* transfer procedures.

Part 3 Site Assessment

This part recognizes that sites for *underground storage tanks* have different sensitivities to the consequences of *underground storage tank system* leaks. Part 3 contains recommendations that will enable the classification of sites. Factors that should be considered in classifying sites are outlined.

Part 4 Design and Installation of Underground Storage Tank Systems

The design and installation of new *storage tank* systems are covered in Part 4. The recommendations covering tanks, *piping* and associated equipment are intended to ensure that equipment is designed and installed properly in order to minimize the possibility of *storage tank* system leaks. A significant portion of this part refers to the National Fire Code.

Part 5 Upgrading of Existing Storage Tank Systems

This part outlines requirements for the upgrading of existing *underground storage tank systems*. This part is provided to ensure that those *storage tank* systems that are currently considered to be inadequately protected from corrosion are replaced or upgraded within a reasonable period of time to acceptable standards.

Part 6 Operation and Maintenance

Part 6 addresses the ongoing operation and maintenance of *storage tank* systems. The intention is to prevent product releases. However, when they do occur, the recommendations in this part are designed to help *storage tank system operators* detect, terminate and mitigate releases as quickly as possible.

Part 7 Withdrawal from Service

This part contains the requirements for the closure and withdrawal from service of *storage tank* systems either temporarily or permanently. Tank removal and disposal provisions are provided to ensure that *abandoned storage tanks* do not cause environmental problems.

Appendix A Guide to Enforcement and Example Administration and Enforcement Provisions

The Guide to Enforcement contains advice to the adopting authority on preparing the administrative requirements necessary for the enactment of the Environmental Code. Example administrative and enforcement provisions are provided for the lawmakers. Such provisions may be applicable in *underground storage tank* law and enabling legislation.

Appendix B Explanatory Material

Appendix B contains explanations to assist the user in understanding the Environmental Code requirements. The numbering system used in the Appendix corresponds with the appropriate Article in the Environmental Code.

Appendix C Minimum Information Required for Registration of Underground Storage Tank Systems

With respect to tank registration, each jurisdiction shall request, as a minimum, the information listed in this Appendix.

Appendix D Soil Aggressiveness Analysis Procedures

The procedures that may be used to assess the soil corrosiveness or aggressiveness towards steel tanks are detailed in Appendix D.

Appendix E Secondary Containment Specifications

Some basic performance criteria and specifications for *secondary containment* systems are provided because there are currently no other standards for *secondary containment* systems or double wall tanks.

Appendix F Leak Detection

Acceptable leak detection technologies are discussed in this Appendix.

Part 1
Application and Definitions

SECTION 1.1 Application

1.1.1 Unless otherwise specified the *owner* of an *underground storage tank system* shall be responsible for complying with the provisions of this Environmental Code.

1.1.2 This Environmental Code applies to all *underground storage tank systems* used for storage of *petroleum products*.

SECTION 1.2 Equivalents

1.2.1 The provisions of this Environmental Code are not intended to limit the appropriate use of materials, systems or equipment not specifically described herein.

1.2.2 Materials, systems, equipment and procedures not specifically described herein or which vary from specific requirements in this Environmental Code, or for which no recognized test procedure has been established, are permitted if it can be shown that they are suitable on the basis of past performance, or on the basis of *acceptable* tests or evaluation.

SECTION 1.3 Alternate Test Standards

1.3.1 The results of tests based on test standards other than described in this Environmental Code may be used provided such alternate test standards produce comparable results.

SECTION 1.4 Alternatives

1.4.1 (1) Alternatives to requirements in this Environmental Code may be permitted provided the *authority having jurisdiction* is satisfied that

(a) the *existing* underground storage tank system provides an *acceptable* degree of environmental protection, or

(b) measures are taken to provide an *acceptable* degree of environmental protection.

SECTION 1.5 Definitions of Words and Phrases

1.5.1 Words and phrases that are not included in the list of defined terms in this Part shall have the meanings that are commonly assigned to them in the context in which they are used in this Environmental Code, taking into account the specialized use of terms by various trades and professions to which the terminology applies.

1.5.2 The words and terms used in this Environmental Code that are in *italics* shall have the following meanings unless otherwise indicated by the context.

abandoned or **abandon** means, when used in reference to a *storage tank* system, any *storage tank* system that has been unused for the purpose of *handling petroleum products* for more than twelve consecutive months, or when declared to be *abandoned* by the *owner* or by the *authority having jurisdiction*.

acceptable means *acceptable* to the *authority having jurisdiction*.

alteration, **altering** or **alter** means any enlargement, upgrading, or removal of a *storage tank* system or any change in the configuration of the *piping*, tanks, or the replacement of any tank or line.

appliance means a device to convert fuel into energy, and includes all components, controls, wiring and *piping* required to be part of the device by the applicable standard referenced in the National Fire Code of Canada.

appliance supply piping means the fuel *piping* leading to the burner of an *appliance* from a supply tank or in the case of a central oil distribution system from the sub atmospheric or demand valve immediately downstream of the meter.

approval or **approved** means *acceptable* to the *authority having jurisdiction*

authority having jurisdiction refer to Appendix A, Guide to Enforcement.

bodies of water means a creek, stream, river, estuary, ocean, pond, lake, aquifer, well, reservoir, water pipes, groundwater occurrence or any other such accumulation of or conduct of water whether above or below ground and includes a dry watercourse.

building means any structure used or intended for supporting or sheltering any use or occupancy.

cathodic protection or cathodically protected means a method of preventing corrosion to a metal surface by introducing another metal (anode) into the ground to create a corrosion cell in which the surface to be protected becomes a cathode. Deterioration or corrosion occurs at the anode (introduced metal). The cathodic protection may be of a sacrificial type or of an impressed current design.

combustible liquid means any liquid having a closed cup *flash point* at or above 37.8°C and below 93.3°C.

corrosion expert means a person recognized by the National Association of Corrosion Engineers (NACE) as a corrosion engineer specializing in the protection of buried structures.

day means any continuous 24 hour period.

discharge means any emission resulting in the releasing, spilling, leaking, pumping, pouring, emitting, emptying or dumping of *petroleum product* whether intentional or unintentional into the waters of the province or territory or onto lands from which it might flow or drain into bodies of water or into bodies of water outside the jurisdiction of the province or territory when damage may result to the lands, waters or natural resources within the jurisdiction of the province or territory.

empty means, when used in reference to a *storage tank* system, void of its contents as far as is practicable by such means as suction, pouring, or pumping.

existing means that which has commenced operation prior to the effective date of this Environmental Code.

flammable liquid means any liquid having a closed cup *flash point* below 37.8°C and having a vapour pressure not exceeding 275.8 kPa (absolute) at 37.8°C.

flash point means the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

fuel oil means kerosene, or any hydrocarbon oil as classified in CSA Standard B140.0, General Requirements for Oil Burning Equipment.

furnace means a boiler or a space heating *appliance* using warm air as the heating medium and usually having provision for the attachment of ducts.

handling means the storing, transmitting, transporting or distributing of *petroleum products* and includes putting *petroleum products* into the fuel tank of a motor vehicle, motor boat or other water craft, or into a container.

interstitial space means the space between the two walls or barriers within a *secondary containment* system.

leakage, leak or leaking means any *discharge* of *petroleum products* from a *storage tank* system, pipeline, tank vessel, tank car or tank vehicle, other than through the usual function for which the *storage tank* system or pipeline was designed.

line leak detector means a device used in pressure *piping* systems to detect a leak in the *piping*.

lining means a coating of a non corrodible material resistant to the product stored and bonded firmly to the interior surface of the tank.

new facility means a facility that has not yet commenced operation on the effective date of this Environmental Code.

operator means the person who is responsible for the *day* to *day* operation of a *service station*, marina, consumer outlet or bulk plant or other installation where *underground storage tanks* are located, as the case may be, and who is normally located on the premises during the hours of operation.

out-of-service means a facility or portion thereof no longer in use. Facilities or tanks used for seasonal storage, for surcharge storage, or for standby storage, are not considered *out of service*.

overfill protection device means a mechanical and/or electrical device that is installed in a *storage tank* fill tube or *vent* that prevents a *storage tank* from being overfilled when product is being delivered to the *storage tank*.

owner means an institution, corporate entity, government agency or a person who has legal ownership rights or has been assigned the custody to control, care for, manage or dispose of the *underground storage tank system* for the purposes of this Environmental Code, the *owner* of the lands in or on which a *storage tank* system is located shall be deemed to be the *owner* of the *storage tank* system unless the *owner* of the land satisfies the *authority having jurisdiction* that the system is owned by another institution, government agency or person.

partially buried tank means a *storage tank* that has ten percent or more of its volume below adjacent ground level.

petroleum product means a mixture of hydrocarbons, with or without additives, that is used, or could be used, as a combustible fuel and, without restricting the foregoing, includes gasoline, diesel fuel, aviation fuel, kerosene, naphtha, lubricant, *fuel oil*, engine oil (including waste engine or lubricant oil) and heating oil, and excludes propane, paint and solvents.

piping includes all pipes, fittings, and valves or other devices attached to pipes, fittings, and valves necessary for safe *handling* and storage of a *petroleum product* in an *underground storage tank system* and its delivery to the dispenser.

secondary containment means containment which prevents any materials spilled or leaked from the primary *storage tank* system from reaching the land or water outside the containment area before cleanup occurs and includes double wall *storage tanks* and *piping* and impermeable membranes or liners.

service station means any premises at which *flammable or combustible liquids* are put into the fuel tanks of vehicles and includes marine *service stations* and self service outlets.

spill or spillage means any loss of *petroleum products* from a *storage tank* system, pipeline, dike, tank vessel or vehicle onto or into the soil or water.

storage tank means an *underground or a partially buried storage tank*.

underground storage tank means a *storage tank* that is completely buried by or covered with earth, backfill or concrete or a *partially buried tank*.

underground storage tank system means one or more completely buried and/or partially buried (commonly connected) *storage tank(s)* with all underground and aboveground connections, *piping*, pumps and dispensers.

unprotected means without *acceptable* corrosion protection.

vent means an opening in a *storage tank* system that is specifically designed to relieve excess pressure or vacuum on the tank without spillage of liquid *petroleum product*.

waste oil means any used *petroleum product* no longer suitable for its initially intended use.

SECTION 1.6 Referenced Documents

1.6.1 Where a conflict exists between the provisions of this Environmental Code and those of a referenced document, the provisions of this Environmental Code shall apply.

1.6.2 Unless otherwise specified herein, the documents referenced in this Environmental Code shall include all amendments, revisions and supplements effective June 30, 1988.

1.6.3 Where documents are referenced in this Environmental Code, they shall be the editions designated in Table 1.6.3.

TABLE 1.6.3

DOCUMENTS REFERENCED IN THE ENVIRONMENTAL CODE OF PRACTICE FOR UNDERGROUND STORAGE TANK SYSTEMS CONTAINING PETROLEUM PRODUCTS — 1988

Issuing Agency	Document Number	Title of Document
Canadian Standards Association		
CSA Standard	B139 1976	Installation Code for Oil Burning Equipment
CSA Standard	B140.0	General Requirements for Oil Burning Equipment
National Research Council		
NRC	NRCC 23175	National Fire Code of Canada - 1985
Petroleum Association for the Conservation of the Canadian Environment		
PACE	87 1	Guideline Specification for the Impressed Current Method of Cathodic Protection of Underground Petroleum Storage Tanks
Underwriters' Laboratories of Canada		
ULC	CAN4 S603 M85	Standard for Steel Underground Tanks for Flammable and Combustible Liquids
ULC	CAN4 S603.1 M85	Standard for Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids
ULC	CAN4 S603(A)	Refurbishing of Steel Underground Tanks for Flammable and Combustible Liquids
ULC	CAN4 S615 M85	Standard for Reinforced Plastic Underground Tanks for Petroleum Products
ULC	CAN4 S615(A)	Refurbishing of Reinforced Plastic Underground Tanks for Petroleum Fuels

SECTION 1.7 Abbreviations

1.7.1 The abbreviations used in this Environmental Code for the names of associations or codes shall have the meanings assigned to them in this Article. The addresses of the associations or code sponsoring organizations are shown in brackets.

CAN	National Standards of Canada designation (The number following the CAN designation represents the agency under whose auspices the standard was issued. CAN 1 designates Canadian Gas Association, CAN 2 designates Canadian General Standards Board, CAN 3 designates Canadian Standards Association and CAN 4 designates Underwriters' Laboratories of Canada.)
CSA	Canadian Standards Association (178 Rexdale Blvd, Rexdale, Ontario M9W 1R3)
NACE	National Association of Corrosion Engineers (1440 South Creek Drive, P.O. Box 218340, Houston, Texas, U.S.A. 77218)
NFC	Designates the National Fire Code of Canada which is published under the auspices of the National Research Council of Canada (National Research Council of Canada, Ottawa, Ontario K1A 0R6).
PACE	Petroleum Association for the Conservation of the Canadian Environment (1202 Slater Street, Ottawa, Ontario K1P 5H9)
ULC	Underwriters' Laboratories of Canada (7 Crouse Road, Scarborough, Ontario M1R 3A9)

1.7.2 Abbreviations of words and phrases in this Environmental Code shall have the meanings assigned to them in this Article.

cm	centimetre(s)
°C	degree(s) Celsius
kPa	kilopascal(s)
L	litre(s)
m	metre(s)
min	minute(s)
mL	millilitres
mm	millimetre(s)
V	volt(s)

Part 2
Registration of Underground Storage Tank Systems

SECTION 2.1 Scope

2.1.1 This part applies to the registration of all *underground storage tank systems* containing *petroleum products*.

SECTION 2.2 Registration of Existing Tank Systems

2.2.1 The *owner* of any *existing underground storage tank system* shall register all tanks of the system with the *authority having jurisdiction* in a manner and timeframe specified by the *authority having jurisdiction*.

2.2.2 The registration of an *existing storage tank* system shall be conducted by completing and filing in a prescribed manner a registration form prescribed by the *authority having jurisdiction*. (See Appendix B and C.)

2.2.3 The *owner* of an *existing storage tank* system shall identify registered tanks by a method and in a time frame *acceptable* to the *authority having jurisdiction*. (See Appendix B.)

2.2.4 The *authority having jurisdiction* may deem the age of a *storage tank system* to be unknown unless the *owner* provides the *authority having jurisdiction* with either the date of installation or the date of manufacture.

2.2.5 The new *owner* of a *storage tank* system shall notify the *authority having jurisdiction* in writing within 30 *days* of transfer of ownership and provide the information prescribed by the *authority having jurisdiction*.

SECTION 2.3 Registration of New Tank Systems

2.3.1 No person shall construct or cause to construct, install or operate a *storage tank* system without first completing and filing in the prescribed manner a registration form prescribed by the *authority having jurisdiction*. (See Appendix C.)

2.3.2 The *owner* of a *storage tank* system shall identify registered tanks by a method *acceptable* to the *authority having jurisdiction*. (See Appendix B.)

SECTION 2.4 Product Supply and Registration

2.4.1 No person shall transfer *petroleum products* to an *underground storage tank system* unless the *storage tank* system has been registered with the *authority having jurisdiction* after the timeframe provided in Article 2.2.1.

Part 3
Site Assessment

SECTION 3.1 Scope

3.1.1 This part applies to the classification of *existing* or proposed sites of all *underground storage tank systems* containing *petroleum products*.

SECTION 3.2 General Requirements

3.2.1 The *authority having jurisdiction* shall assess each proposed facility site on a case by case basis and declare that the site be classified as Class A or Class B or Class C.

3.2.2 The *authority having jurisdiction* may also assess each *existing* site of *underground storage tank system* and classify each site as Class A or Class B or Class C.

SECTION 3.3 Site Classification

3.3.1(1) In general, sites shall be classified as Class A, B or C sites according to their sensitivity for potential impact on the environment or on human health and safety.

(2) Class A sites shall be considered the most sensitive and Class C sites the least sensitive.

3.3.2 If a site is not specifically assessed and classified, it will be assumed to be a Class A site.

3.3.3(1) In classifying a site, the *authority having jurisdiction* may consider factors including but not limited to:

(a) the quality and quantity of the groundwater resource that could be affected by a *leak*,
(b) the density and proximity of wells,
(c) the local geology,
(d) the proximity of *bodies of water*,
(e) the proximity of densely populated areas,
(f) the proximity of subsurface structures and subsurface utility corridors,
(g) the presence in the area of geological, hydrogeological or environmental conditions, structures or animal, bird, aquatic or plant life that necessitates the taking of unusual precautions to prevent pollution of the environment.

3.3.4(1) The *authority having jurisdiction* may require that *owners* of *existing storage tank* systems make application for a site assessment.

(2) The *authority having jurisdiction* shall require that owners proposing to install a *storage tank* system make application for a site assessment.

(3) An application for a site assessment shall be on a form prescribed by, and completed in a manner and time frame as specified by, the *authority having jurisdiction*.

3.3.5 When requested by the *authority having jurisdiction*, the *owner* of an *existing storage tank* system or applicant for a proposed, *storage tank* system shall provide any additional information the *authority having jurisdiction* considers necessary in order to assess a site for purposes of classification.

Part 4
Design and Installation of New Underground Storage Tank Systems

SECTION 4.1 Scope

4.1.1 This Part applies to the design and installation of *underground storage tank systems* including tanks, *piping*, pumps and associated fittings used in the storage of *petroleum products*.

SECTION 4.2 General Requirements

4.2.1 No person shall construct or cause to construct or install a *storage tank* system unless approval has been obtained from the *authority having jurisdiction*.

4.2.2(1) Where the *authority having jurisdiction* has classified a site as Class A:
(a) *secondary containment* with interstitial *leak* detection for both the tanks and associated *piping* shall be provided (See Appendix F);
(b) an *acceptable overfill or spill protection device* shall be installed.

4.2.3(1) Where the *authority having jurisdiction* has classified a site as Class B:
(a) any underground *storage tank* shall be at least a single wall *cathodically protected* steel, or fibreglass reinforced plastic tank,
(b) *piping* installed as part of an underground *storage tank* system shall be at least a single wall *cathodically protected* steel or fibreglass reinforced plastic pipe, or where the *piping* is *appliance supply piping*, copper tubing installed in conformance with Section 4.8 shall be permitted;
(c) *acceptable leak* detection shall be installed, and
(d) an *acceptable overfill or spill protection device* shall be installed.

4.2.4(1) Where the *authority having jurisdiction* has classified a site as Class C:
(a) the minimum tank design and installation shall be a single wall *cathodically protected* steel or fibreglass reinforced plastic tank;
(b) *piping* installed as part of an underground *storage tank* system shall be at least a single wall *cathodically protected* steel or fibreglass reinforced plastic pipe or where the *piping* is *appliance supply piping*, copper tubing installed in conformance with Section 4.8 shall be permitted.

4.2.5(1) All *waste oil* tanks shall be installed with *acceptable leak* detection.

(2) All *waste oil* tanks shall be exempt from the general requirements for *overfill protection devices*.

SECTION 4.3 Design of New Storage Tanks

4.3.1(1) Except as provided in Article 4.2.1, new single wall *storage tanks* shall be designed and built in conformance with one of the following standards:
(a) CAN4-S603M Standard for Steel Underground Tanks for Flammable and Combustible Liquids,
(b) CAN4-S603.1M Standard for Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids, or
(c) CAN4-S615M Standard for Reinforced Plastic Underground Tanks for Petroleum Products. (See Appendix B.)

4.3.2(1) Double wall *storage tanks* shall be permitted provided that, as a minimum, the inner tank wall meets the requirements of one of the standards in Sentence 4.3.1(1). (See Appendix B.)

(2) The exterior wall of a double wall steel *storage tank* shall be protected in accordance with the standard CAN4 S603.1M or provided with an *acceptable* impressed current *cathodic protection* system.

(3) *Acceptable* interstitial *leak* detection shall be provided.

SECTION 4.4 Installation

4.4.1 *Underground storage tank systems* shall be installed by *approved* installers. (See Appendix B.)

4.4.2(1) Installation of steel *underground storage tanks* shall be in conformance with the tank manufacturers installation instructions, Appendix B of CAN4 S603.1M and the NFC, Subsection 4.3.8.

(2) Installation of fibreglass reinforced plastic *storage tanks* shall be in conformance with the tank manufacturers installation instructions, Appendix A of CAN4 S615 and the NFC, Subsection 4.3.8.

4.4.3 Subject to the provisions of this section, *underground storage tanks* that are connected to heating *appliances* that come within the scope of CSA Standard B139, Installation Code for Oil Burning Equipment, shall be installed in conformance with Section 6.3 CSA Standard B139.

4.4.4 Installers of all *underground storage tank systems* shall ensure that the system is installed in conformance with all requirements of this Part.

4.4.5 Where a *storage tank* has structural shell damage it shall not be accepted for installation unless it has been repaired in conformance with Sentence 4.4.6(1).

4.4.6(1) An *underground storage tank* that is structurally damaged shall not be repaired on site and used for storage of a *petroleum product* unless:

(a) the repair is done by the manufacturer in accordance with ULC refurbishing specifications,

(b) the manufacturer certifies in writing that the repaired tank meets the applicable manufacturing codes, and

(c) the condition of the repaired *storage tank* is *acceptable* to the *authority having jurisdiction*.

4.4.7(1) New *underground storage tanks* and associated *piping* shall be leak tested by an *acceptable* method before backfilling at the time of installation in conformance with the NFC Subsection 4.3.16 and Subsection 4.4.6.

(2) In addition to the provisions of sentence 4.4.7 (1), to ensure the final connections are tight a new *storage tank* system shall be leak tested as a complete system after the final connection has been made to the tank by subjecting the entire system to a 15 minute, 35 kPa pneumatic pressure test, measured by an instrument calibrated in increments not greater than 1 kPa and by applying soap, oil or another *acceptable* liquid to the final connections. (See Appendix B.)

4.4.8 *Storage tanks* shall be located to permit the eventual removal of the *storage tanks* when the *storage tank* system is permanently withdrawn from service. (See Appendix B.)

SECTION 4.5 Corrosion Protection of Underground Steel Storage Tank Systems

4.5.1 Except as provided in Articles 4.5.2 to 4.5.3, all steel *storage tanks* shall be provided with corrosion protection according to NFC Subsection 4.3.9.

4.5.2(1) The installer shall check for electrical continuity between each anode and the tank prior to backfilling a *storage tank*. (See Appendix B.)

(2) All new installations of steel *underground storage tanks* shall be tested for adequate corrosion protection after the backfill is filled in to the top of the *storage tank*, but before the excavation is closed in and paved over. The installer shall measure the *cathodic protection* voltage potential to determine whether *cathodic protection* has been achieved.

(3) If a *cathodic protection* potential of at least 850 millivolts negative to a copper/copper sulphate reference electrode is not attained, corrective action shall be taken to reach the 850 millivolt reading.

(4) The installer of an *underground storage tank system* shall upon completion of the installation certify in writing to the *owner* that *acceptable cathodic protection* has been achieved.

4.5.3(1) Any new *storage tank* added to an *existing* system that is protected by an impressed current *cathodic protection* system shall be of the CAN4 S603M design and shall be electrically bonded into the impressed current *cathodic protection* system and have anodes to protect it. (See Appendix B.)

(2) Where *existing storage tank* systems that contain one or more sacrificial anode protected tanks (CAN4 S603.1M) are to be upgraded with an impressed current *cathodic protection* system, all tanks shall be bonded into the impressed current *cathodic protection* system as described in PACE Report 87-1.

(3) Where a new *cathodically protected* steel *storage tank* (CAN4 S603.1M) is installed near existing *unprotected*, or sacrificial anode protected (CAN4 S603.1M) tanks or tank systems, the new tank shall be electrically isolated from the *existing* system and shall be *cathodically protected* in conformance with this section. (See Appendix B.)

SECTION 4.6 Vents for Underground Storage Tanks

4.6.1 Subject to Articles 4.6.2 to 4.6.4, *vents* for *underground storage tanks* shall be designed and installed in conformance with NFC Subsection 4.3.10, except *vent* screens shall not be used as a means of preventing entry of foreign material.

4.6.2 *Vents* for *underground storage tanks* connected to heating *appliances* and under the scope of CSA Standard B139 Installation Code for Oil Burning Equipment shall be designed and installed in conformance with CSA Standard B139 clauses 6.9.1 through 6.9.10.

4.6.3 All steel *vent* pipes, including galvanized steel pipes, shall be *cathodically protected* from corrosion in conformance with Section 4.5 of this Environmental Code. (See Appendix B.)

4.6.4 *Vent* lines are not required to be double walled.

SECTION 4.7 Openings Other Than Vents in Underground Storage Tanks

4.7.1 Except as provided in Article 4.7.2, openings other than *vents* in *underground storage tanks* shall conform to NFC Subsection 4.3.11.

4.7.2 *Storage tanks* connected to heating *appliances* shall have a fill opening or a fill pipe conforming to CSA Standard B139 clause 6.8.

SECTION 4.8 Piping and Pumping Systems

4.8.1 Except as provided in this Part, *piping* and pumping systems for *underground storage tanks* containing *petroleum products* shall be designed, built and installed in conformance with the NFC Sections 4.4 and 4.5.

4.8.2 Subject to Articles 4.8.3 and 4.8.4(1) and (2), *appliance supply piping* and return *piping* and tubing used in conjunction with or part of a heating oil or *fuel oil storage tank* system that is connected to an oil burning *appliance* shall be designed and installed in conformance with Part 8 of CSA Standard B139, Installation Code for Oil Burning Equipment.

4.8.3 All new steel pipe, including galvanized pipe, shall be *cathodically protected* in conformance with Section 4.5 of this Environmental Code.

4.8.4(1) Supply and return line copper tubing does not need to be *cathodically protected* but it shall be

- (a) part of a *secondary containment* system, and
- (b) installed within polyvinyl chloride (PVC) pipe or other material compatible with the *petroleum product*.

(2) Buried supply and return line tubing shall slope towards the tank, at a slope greater than one per cent, and a manhole or an access point to the *piping* connections shall be provided so that line leaks may be detected.

4.8.5(1) Except as provided in Sentence 4.8.5(2), remote pumping systems or submersible pump systems shall conform to NFC Subsection 4.5.6.

(2) Where submersible pumps or pumps remote from the dispensing unit are used an *approved* line *leak* detector shall be installed. (See Appendix B.)

Part 5

Upgrading of Existing Storage Tank Systems

SECTION 5.1 Scope

5.1.1 This part applies to all *underground storage tank systems* containing *petroleum products* installed prior to the date this Environmental Code is adopted by the *authority having jurisdiction*.

SECTION 5.2 General Requirement

5.2.1 No person shall *alter* or cause to *alter* a *storage tank* system unless written approval has been obtained from the *authority having jurisdiction*.

SECTION 5.3 Tanks

5.3.1 *Existing unprotected* steel tanks at Class A and Class B sites, shall be upgraded subject to Section 5.5 or replaced as per the terms of either Table 5.3.1 or the soil agressiveness analysis procedures described in Appendix D. (See Appendix B.)

TABLE 5.3.1

STORAGE TANK SYSTEMS UPGRADING SCHEDULE

ALL CLASS A AND CLASS B SITES OR UNCLASSIFIED SITES

Age of tank system in years from date of installation	Replace, or upgrade and add *acceptable* leak detection. (time in years after a date specified by the *authority having jurisdiction*)
*25 and greater or unknown	2 (replace only)
20-24	3
15-19	4
10-14	4
5-9	5
0-4	5

*An *unprotected* tank shall be replaced rather than upgraded once it is 25 years old.

5.3.2 *Existing unprotected* steel tanks at Class C sites shall be upgraded subject to Section 5.5 or replaced as per the terms of either Table 5.3.2 or Appendix D.

TABLE 5.3.2

STORAGE TANK SYSTEMS UPGRADING SCHEDULE

CLASS C

Age of tank system in years from date of original installation	Upgrade or replace (time in years after a date specified by the *authority having jurisdiction*)
*25 and greater or unknown	4 (replace only)
20 24	5
15 19	6
10 14	7
5 9	8
0 4	9

*An *unprotected* tank shall be replaced rather than upgraded once it is 25 years old

5.3.3.(1) The *authority having jurisdiction* may require that the tank system owner conduct an *acceptable* precision leak test on any *existing unprotected* steel tanks

(2) Where a precision leak test is required by the *authority having jurisdiction*, it shall be conducted and reported in conformance with Section 6 7.

5.3.4 *Existing* single wall steel tanks, 25 years old or greater or of unknown age, not *cathodically protected*, at all sites, shall be either

(a) withdrawn from service and removed in conformance with Part 7 or,

(b) withdrawn from service and removed in conformance with Part 7 and replaced by a new storage tank installed in conformance with Part 4 of this Environmental Code (See Appendix B.)

5.3.5 When an *owner* upgrades or replaces a leaking or an *existing storage tank* system, all remaining *unprotected* tanks and *piping* in close proximity to the upgraded or replaced tank shall be upgraded or replaced within 180 *days*

5.3.6(1) All existing steel tanks that are *cathodically protected* by sacrificial anodes (CAN4 S603 1M tanks) shall be tested for *cathodic protection* voltage potentials within two years of the date the *authority having jurisdiction* adopts this Environmental Code (See Appendix B.)

(2) If the measured *cathodic protection* voltage is less than 850 millivolts negative to a copper/copper sulphate reference electrode, then upgrading or other corrective action in conformance with Section 4 5 is necessary

5.3.7 All *existing* protected tanks at Class A and B sites, shall have *acceptable leak detection* installed and operational within two years of the site being designated either a Class A or a Class B site

SECTION 5.4 Piping

5.4.1(1) All *existing* steel *piping* shall be *leak* tested whenever the associated *storage tanks* are tested

(2) All existing steel piping shall be upgraded or replaced whenever the associated *storage tanks* are tested, upgraded or replaced in conformance with Section 5 3

5.4.2(1) When *existing unprotected* steel or galvanized pipe is connected to an *existing cathodically protected* tank (CAN4 S603 1M) or fibreglass reinforced plastic tank (CAN4 S615M) that does not require upgrading or replacement, the *piping* shall be either replaced or *leak* tested and upgraded by the addition of *cathodic protection* in conformance with Section 4 5 of this Environmental Code:

(a) within three years of the date adopted by the *authority having jurisdiction* for Class C sites, and

(b) within two years for Class A, and Class B sites

SECTION 5.5 Acceptable Upgrading Technology

5.5.1(1) Where required by Section 5 3, upgrading of *storage tanks* shall be by

(a) replacement of tanks in conformance with Part 4 of this Environmental Code, or

(b) installation of an impressed current *cathodic protection* system designed and installed according to the specifications and instruction of a *corrosion expert*, or designed and installed in conformance with PACE 87 1 or other *acceptable* standards, or

(c) the addition of sacrificial anodes in conformance with Section 4 5 to existing CAN4 S603 1M tanks that are subject to Sentence 5 3 6(2) (See Appendix B.)

5.5.2(1) Where required by Section 5 4, upgrading of *storage tank* system *piping* shall be by

(a) replacement of *existing piping* with new *piping* in conformance with Part 4 of the Environmental Code, or

(b) addition of a *cathodic protection* system (sacrificial anodes or impressed current) designed and installed in conformance with Section 4 5

SECTION 5.6 Internal Tank Lining

5.6.1(1) An internal *lining* is permitted to be installed as a means to prevent internal corrosion of an underground *storage tank*, provided that

(a) after internal sand blast cleaning, the *storage tank* is not perforated

(b) the installation of the internal *lining* is under the direction of the *lining* manufacturer or a certified representative, and

(c) the coating material and its application meets requirements *acceptable* to the *authority having jurisdiction* (See Appendix B.)

SECTION 5.7 Overfill/Spill Protection

5.7.1 Except as provided in Articles 5 7 2 and 5 7 3, at the time that a *storage tank* system at a Class A or Class B site is upgraded by the addition of *acceptable leak* detection, *overfill* or *spill* protection shall be provided in the form of either

(a) a catchment basin (*spill* protection device), or

(b) an *overfill protection device*

5.7.2 Tanks connected to heating *appliances* under the scope of CSA Standard B139 do not require *overfill* or *spill* protection as specified in Article 5 7 1, but *vent* alarms are required as per CSA Standard B139 clause 6 9 4

5.7.3 *Waste oil storage tanks* are not required to have *overfill* or *spill* protection devices as required in Article 5 7 1

5.7.4(1) All *waste oil* tanks shall have removable suction tubes installed within two years of the date the *authority having jurisdiction* adopts this Environmental Code (See Appendix B.)

(2) Suction tubes as required in Sentence 5.7.4(1) shall be fitted with *leak tight* couplings for connection to the product removal suction hose (on the *waste oil* haulers vehicle), which shall be used when *waste oil* is being removed from the *storage tank*.

5.7.5 A liquid and vapour-tight connection shall be installed on fill tubes where *flammable* products are delivered to a *storage tank*, as of a date specified by the *authority having jurisdiction*. (See Appendix B.)

Part 6
Operation and Maintenance

SECTION 6.1 Scope

6.1.1 This part applies to the operation and maintenance of *underground storage tank systems* containing *petroleum products*.

SECTION 6.2 Records

6.2.1 The *owner* of a *petroleum product storage tank* system or his designated representative, shall maintain inventory control records and reconciliation data on site for a period of at least two years for examination by the *authority having jurisdiction*.

6.2.2 When there is a change in *operator* of an *underground storage tank system*, the departing *operator* shall transfer the inventory control records and reconciliation data required under Article 6.2.1 to the incoming *operator*.

6.2.3(1) The *owner* of a *petroleum product storage tank* system shall maintain records of all

(a) cathodic protection voltage measurements,
(b) impressed current system checks,
(c) line *leak* detection system tests,
(d) *leak* detection equipment tests and checks,
(e) precision *leak* test results,
(f) excavation or nearby construction that could affect the integrity of the *storage tank* system, and
(g) inspections, tests or maintenance checks of *storage tank* system equipment.

(2) The *owner* shall retain the records required in Sentence 6.2.3(1) for examination by the *authority having jurisdiction* for a period of at least five years.

6.2.4 The *owner* of a *petroleum product storage tank* system shall maintain a record of all *alterations* and upgrading for examination by the *authority having jurisdiction* for the life of the *storage tank* system.

6.2.5 Where there is a change in the *storage tank* system *owner*, the *owner* of records required under Articles 6.2.3(1) and 6.2.4 shall transfer all such records to the new *owner*.

SECTION 6.3 Corrosion Protection Monitoring

6.3.1(1) Except as provided in Article 6.3.2, maintenance checks on the operation of *cathodic protection* systems shall be conducted in conformance with

(a) CAN4-S603.1M for sacrificial anode systems, or
(b) PACE Report No. 87-1 clause 5.5(c) and Part 6.0, for impressed current systems.

6.3.2 *Cathodic protection* voltage measurements conducted in conformance with Clause 6.3.1(1)(a) shall be considered satisfactory if the measured voltage is equal to or greater than 850 millivolts negative but less than 1100 millivolts negative using a copper/copper sulphate reference electrode.

6.3.3 Where corrosion protection monitoring conducted in conformance with this section indicates inadequate corrosion protection, immediate corrective measures in conformance with Section 4.5 shall be taken.

SECTION 6.4 Leak Detection

6.4.1 Subject to Article 6.4.2, inventory control shall be conducted in conformance with NFC Subsection 4.3.17

6.4.2 Inventory control records required under Article 6.4.1 shall be kept in an *acceptable* manner and format.

6.4.3(1) Submersible or remote pump systems that have *approved* line *leak* detectors installed in conformance with Sentence 4.8.5(2), shall have the line *leak* detector inspected and tested in accordance with the manufacturer's instructions for satisfactory operation at least annually

(2) A record of the annual inspections and tests shall be kept in conformance with Sentence 6.2.3(1)

SECTION 6.5 Product Transferring Operations

6.5.1 A person responsible for transferring product to an *underground storage tank* shall take all reasonable steps to prevent *spillage*

6.5.2 Subject to the provisions of this section, when tank vehicles are being unloaded or loaded the operation shall be in conformance with NFC Subsection 4.11.12

6.5.3(1) When tank vehicles are being unloaded, vehicle *operators* shall remain

(a) in constant view of the transfer nozzle and fill pipe, and
(b) in constant attendance at the discharge control valve
(See Appendix B.)

6.5.4 *Waste oil storage tanks* fitted with a suction tube and *leak* tight coupling in conformance with Sentences 5.7.4(1) and 5.7.4(2) shall not have suction hoses dropped or inserted into the *waste oil storage tank* during the product removal process

6.5.5 Removal of product from a *waste oil storage tank* after a date specified by the *authority having jurisdiction* shall require making a connection to the coupling at the end of the suction tube that is inserted in the *waste oil storage tank*

6.5.6 Within a timeframe specified by the *authority having jurisdiction*, no person shall transfer *flammable liquids* unless a liquid and vapour tight fill connection to the *flammable product storage tank* is made

SECTION 6.6 Suspected Leak, Leak and Spill Response

6.6.1 The *owner* or *operator* of an *underground storage tank system* who discovers, suspects, or is notified by any person of possible *leakage* shall immediately notify the *authority having jurisdiction* by telephone and provide the information requested by the *authority having jurisdiction*. (See Appendix B.)

6.6.2(1) The *owner* of a *storage tank* system where a leak is known or suspected, in consultation with the *authority having jurisdiction* shall take such actions as the *authority having jurisdiction* requires to verify, stop, cleanup and mitigate the impacts of a *leak*, including but not limited to the following requirements

(a) at the owner's expense, remove the suspected *leaking storage tank* or *piping* or arrange for a precision leak test to be conducted in conformance with Section 6.7
(b) arrange for immediate removal of the *petroleum product* from components of the *storage tank* system and the removal of the affected system within a reasonable time,
(c) take all reasonable steps to establish the extent of the contamination (including vapours), contain the *leaked petroleum product* and prevent its further migration, and
(d) take all reasonable steps to recover or remove escaped *petroleum product*

SECTION 6.7 Precision Leak Test

6.7.1(1) An *acceptable* precision *leak* test shall

(a) be *acceptable* to the *authority having jurisdiction*,
(b) be capable of detecting a loss of product or a gain of water of less than 0.380 litres/hour with a probability of detection equal to or greater than 0.99 and a probability of false alarm equal to or less than 0.01 and
(c) be conducted by a testing agent registered with the *authority having jurisdiction*. (See Appendix B.)

6.7.2(1) When an *acceptable* precision *leak* test has been required by the *authority having jurisdiction*, a precision *leak* test report shall be forwarded to the *authority having jurisdiction* within ten days of the test

(2) The precision *leak* test report shall contain as a minimum the following information

(a) tank registration number,
(b) location of test,
(c) date of test,
(d) results of test,
(e) test methods,
(f) certification by testing agent that the test complies with *acceptable* procedures for conducting a precision *leak* test, and
(g) name and address of testing agent

6.7.3 Except for new *storage tank* systems as provided for in Sentence 4.4.7(1), air or nitrogen pressure testing of *storage tanks* shall not be considered a precision *leak* test. (See Appendix B.)

6.7.4 Air or nitrogen testing of *piping* shall be considered an *acceptable* precision *leak* test provided the testing is conducted in conformance with NFC Section 4.4.6. (See Appendix B.)

Part 7
Withdrawal of Tank Systems From Service

SECTION 7.1 Scope

7.1.1. This Part applies to the procedures to be followed when *storage tank* systems for *petroleum products* are removed, relocated, *abandoned*, disposed of, refurbished or temporarily taken *out of service*.

SECTION 7.2 Temporary Withdrawal From Service

7.2.1 Except as provided in Articles 7.2.2 through 7.2.5 when a *storage tank* system will be temporarily *out of service*, the *storage tank* system shall be rendered *out of service* in conformance with the NFC Subsection 4.10.2.

7.2.2 Except for *storage tank* systems that have been registered with the *authority having jurisdiction* as operating on a seasonal basis, the *owner* or *operator* of a *storage tank* system that is to be withdrawn from service for a period of more than 30 *days* but less than 180 *days*, shall notify the *authority having jurisdiction* before the *storage tank* goes *out of service*, and shall provide any information requested by the *authority having jurisdiction*.

7.2.3(1) Where the *storage tank* system uses an impressed current *cathodic protection* system, the *owner* shall ensure that the system is maintained and operated throughout all periods when the *storage tank* system is withdrawn from service. (See Appendix B.)

(2) Where the impressed current system is not maintained and operated continuously, the *authority having jurisdiction* may disallow the *storage tank* to be reactivated and may require it be removed in conformance with Section 7.3.

7.2.4(1) Except for *storage tank* systems that have been registered with the *authority having jurisdiction* as operating on a seasonal basis, when a tank system is to be *out of service* for a period of more than 180 *days*, the *owner* or the *operator* shall notify the *authority having jurisdiction* in writing within seven *days* after the *storage tank* system goes *out of service*, providing the following information:

(a) the name and mailing address of the *owner*,
(b) the name and mailing address of the *operator*,
(c) the location of the system,
(d) a description of the nature and quantity of the contents, and
(e) *storage tank* registration number.

7.2.5(1) Except for *storage tank* systems that have been registered with the *authority having jurisdiction* as operating on a seasonal basis, when a *storage tank* system that has been withdrawn from service for a period of more than 180 *days* is to be reactivated for the storage of *petroleum products*, the *authority having jurisdiction* shall be notified in writing at least seven *days* prior to the *storage tank* system being reactivated, and provided with the following information:

(a) the name and mailing address of the *owner*,
(b) the name and mailing address of the *operator*,
(c) the location of the *storage tank* system,
(d) the intended date of re activation.

7.2.6 *Storage tanks out of service* for more than one year shall pass a precision leak test before the *storage tank* system is returned to service.

SECTION 7.3 Removal of Storage Tank Systems

7.3.1 *Storage tank* systems that have contained *petroleum products* that have no further use or that have been *out of service* for more than two years shall be removed in conformance with the NFC Subsection 4.10.3. (See Appendix B.)

7.3.2 The *owner* of a *storage tank* system shall notify the *authority having jurisdiction* prior to removing a *storage tank* from the ground and provide the information requested by the *authority having jurisdiction*.

SECTION 7.4 Abandonment in Place

7.4.1 Under normal circumstances, a *storage tank* shall not be *abandoned* in the place where it is installed.

7.4.2(1) An *owner* of a *storage tank* system may apply to the *authority having jurisdiction* for *approval* to *abandon* a *storage tank* system permanently in the place in which it is installed by

(a) describing fully in the application, the circumstances of the *storage tank* location that the *owner* feels would bring it within the scope of Sentence 7.4.3(1),
(b) satisfying the *authority having jurisdiction* that the soil under and around the *storage tank* has not been contaminated with a *petroleum product*, and
(c) providing confirmation that the *owner* of the property is aware and in agreement with the plan and procedures to *abandon* the *storage tank* in place.

7.4.3(1) The *authority having jurisdiction* may in its discretion, grant *approval* in writing of an application made under Sentence 7.4.2(1) where it is satisfied that the *storage tank* is

(a) located in whole or in part beneath a permanent *building* or other facility and that excavation of the *storage tank* is not practicable,
(b) so large or of a type of construction that the excavation of the tank is not practicable,
(c) inaccessible to the heavy equipment necessary for removal of the *storage tank*, or
(d) situated so that removal of the *storage tank* would endanger the structural integrity of nearby *buildings* or other facilities.

7.4.4(1) Where the *authority having jurisdiction* has granted *approval*, in writing, to *abandon* a *storage tank* in place, the abandonment procedures shall comply with the following:

(a) *Storage tanks* shall be purged of vapours to less than 10% of the lower *flammable* limit. The presence of vapours shall be checked with a combustible gas meter.
(b) A licensed installer shall enter the *storage tank*, following acceptable safety procedures, and conduct an internal inspection of the *storage tank* for perforations of the *storage tank* shell. If a perforation or perforations are present, then the *authority having jurisdiction* shall be notified according to the provisions of Section 6.5 of this Environmental Code. The *authority having jurisdiction* may require that additional investigation and/or remedial actions be taken.
(c) If it is impractical or impossible to enter the *storage tank* to conduct the internal inspection, the *authority having jurisdiction* may require that a precision *leak* test be conducted in conformance with Section 6.7 of this Environmental Code.
(d) Any sludge in the *storage tank* shall be removed and disposed by a method *acceptable* to the *authority having jurisdiction*.
(e) Sufficient holes shall be cut along the top of the *storage tank* to enable the complete filling of the *storage tank* with an *acceptable* inert material.
(f) The *storage tank* shall be completely filled with *acceptable* inert material.

(g) Sand, gravel or concrete shall be considered *acceptable* inert materials.

(h) A record of the size, description and location of the *storage tank* shall be
  (i) permanently appended to the deed of the property
  (ii) submitted to the *authority having jurisdiction*

(i) Associated *piping* should be removed from service in conformance with NFC Section 4.10.3. (See Appendix B.)

SECTION 7.5 Reuse and Disposal of Storage Tanks

7.5.1(1) Steel *storage tanks* may be reused for the storage of *petroleum products* only after having been refurbished in accordance with Technical Supplement CAN4 S603 (A) – June 1987 "Refurbishing of Steel Underground Tanks for Flammable and Combustible Liquids".

(2) Fibreglass reinforced plastic *storage tanks* may be reused for the storage of *petroleum products* only after having been refurbished in accordance with Technical Supplement CAN4 S615(A) – February 1987 "Refurbishing of Reinforced Plastic Underground Tanks for Petroleum Fuels".

7.5.2 Where *storage tanks* are to be disposed of, sufficient openings shall be cut in the *storage tank* after they have been purged of vapours to render them unfit for further use.

7.5.3 Riveted *storage tanks* shall not be reused for the storage of *petroleum products*.

The Appendices of this document are included for explanatory and information purposes only. They do not form part of the code requirements unless specifically identified.

Appendix A
Guide to Enforcement

A.1.1 Introduction

The Environmental Code of Practice for Underground Storage Tanks Containing Petroleum Products is intended for use by law makers at various levels of government. In practice, regulations governing underground storage tanks are generally administered by the provinces or territories.

Various enforcement options and lists of relevent legislative considerations for each option are identified. Examples of administrative or enforcement provisions are provided in this Appendix because the National Task Force believed their inclusion would be of value to the law makers.

A.1.2 Authority Having Jurisdiction

The Environmental Code uses the phrase "authority having jurisdiction" with reference to the exercise of many enforcement functions and powers. An environmental underground storage tank law should specifically identify the relevant authority or authorities having jurisdiction, either by substituting the appropriate officer's title for the phrase "authority having jurisdiction" whenever that phrase appears in the text, or by defining in one of the introductory provisions of the law the phrase "authority having jurisdiction" to mean the specific officer or officers who will be exercising such functions and powers.

A.1.3 Enforcement Options

There are four areas of concern in connection with enforcement of prescribed environmental underground storage tank standards:

- A.1.3.1 inspections of premises and records,
- A.1.3.2 acceptance (including licences and permits),
- A.1.3.3 offences and penalties, and
- A.1.3.4 remedial orders.

A.1.3.1 Inspection of Premises and Records

Underground storage tank system laws usually include a provision for the appointment of inspectors who have the authority to enforce the law and conduct inspections of premises with respect to the management of underground storage tank systems. The relevant issues in connection with the inspection provision are as follows:

- (a) whether all premises — or only some — may be entered upon by an inspector,
- (b) whether an inspector must have a warrant or a court order before entering upon premises without the consent of the owner or occupant,
- (c) for what purposes premises may be inspected,
- (d) at what times an inspector may inspect premises and records (for example, at any time, or at any reasonable time, or during daylight hours),
- (e) what persons, if any, may accompany the inspector,
- (f) whether the inspector should have power to conduct any tests on the premises relevant to the purpose of the inspection,
- (g) whether the inspector should have power to collect and take away for analysis anything relevant to the purpose [illegible] the inspection and, if so, what obligation he may have with respect to the return thereof,
- (h) what obligation should be imposed upon persons such as the owner or the occupier of the premises to furnish information and assistance to the inspector.

(i) whether it should be an offence for any person to obstruct the inspector in the performance of his duties.
(j) what type of identification inspectors may be provided with,
(k) whether peace officers can be authorized to assist inspectors and what their role may be, and
(l) what are the liabilities of inspectors.

A.1.3.2 Acceptances

The Environmental Code envisages that some activities, materials, devices, products, procedures or structures will require acceptance by the authority having jurisdiction. In some cases, it may be desirable that the acceptance process be formalized by providing for a licence or permit. In other cases the acceptance may be less formal.

(a) Relevant considerations where an acceptance will be required with respect to underground storage tank system law are as follows.
  (i) what formalities should be prescribed in connection with application for acceptance,
  (ii) what information or materials must accompany the application,
  (iii) what criteria should be prescribed for acceptance,
  (iv) what conditions may be attached to the acceptance,
  (v) the circumstances, if any, in which an acceptance may be suspended or cancelled,
  (vi) the rights of appeal, if any, in respect of a refusal, suspension or revocation of an acceptance, and
  (vii) the legal consequences of not having an acceptance when so required by underground storage tank laws.

(b) The Environmental Code of Practice anticipates that acceptance in the form of a permit or licence will be required in the following circumstances.
  (i) a licence or other approval to install, alter or remove underground storage tank systems,
  (ii) a licence or permit to operate a service station or bulk plant,
  (iii) a permit to abandon tanks in place
  (iv) a permit to operate a business that conducts acceptable leak tests,
  (v) a permit/approval to install a tank system at a Class A, B or C site.

A.1.3.3 Offences and Penalties

The most common kind of enforcement provision is the prescription of offences, with penalties upon conviction. The relevant issues in connection with offence and penalty provisions are as follows.

(a) what conduct should be prescribed as an offence (usually, underground storage tank laws provide that any person who contravenes any provision of the law is guilty of an offence, in addition, where the fire safety law authorizes the making of remedial orders, it will usually provide that any person who fails to comply with a lawful order is guilty of an offence),
(b) whether the range of penalties should be uniform for all offences or should vary in severity, and
(c) the nature and extent of the penalty or penalties.

A.1.3.4 Remedial Orders

A possible enforcement option in respect of a contravention of the underground storage tank law is a provision authorizing persons having jurisdiction to issue remedial orders requiring a clean-up or the provision of a water supply to affected parties or premises to be closed or activities to cease, or requiring that an act already done be undone. The relevant issues in connection with provisions for the making of remedial orders are:

(a) in what circumstances, and by whom, can a remedial order be made (it may be that the lawmaker will wish to draw a distinction between circumstances where an inspector or a Minister may make an order and circumstances where an order can only be made by a court),
(b) what can be ordered, depending on the circumstances,
(c) in what circumstances, if any, an order shall take immediate effect,
(d) except for those cases where an order is to take immediate effect, when the order should take effect,
(e) what person may be required to comply with a remedial order,
(f) the rights of appeal, if any, in respect of some or all remedial orders, and
(g) the consequences of failure to comply with a remedial order.

A.1.4 Notification

This Environmental Code envisages that the authority having jurisdiction will be notified.

(a) prior to removing storage tanks from service,
(b) when there is a change in ownership,
(c) of the results of precision leak tests,
(d) when a loss of petroleum product is known or suspected,
(e) when a storage tank system is to be altered.

A.1.5 Example Administration and Enforcement Provisions

A.1.5.1 Inspection of Premises or Records

(a) The authority having jurisdiction may appoint inspectors for the enforcement of these regulations.
(b) The authority having jurisdiction shall issue each inspector a card or certificate of evidence of appointment as an inspector.
(c) An inspector or a person designated by the authority having jurisdiction may at any reasonable time enter onto or into any real or personal property for the purpose of enforcing these regulations.
(d) An inspector may request the assistance of one or more peace officers for the service of any summons.
(e) An inspector acting under these regulations is not personally liable for any loss or damage suffered by any person by reason of any thing done in good faith or omitted in the exercise or enforcement of these regulations.
(f) The occupant of any premises and his servants, agents and employees shall give reasonable assistance to an inspector acting under this legislation.
(g) It is an offence for any person to obstruct an inspector in the performance of the inspectors duties.
(h) An inspector may, for the purposes of carrying out his/her duties:
  (i) enter any premises where there is reasonable grounds to believe that there has been or may be hazardous or environmental threatening conditions relative to petroleum products.
  (ii) make such inspections, tests and inquiries as are necessary to determine compliance with the enabling legislation and the Environmental Code.
  (iii) take samples of any liquid or soil where there is reasonable

grounds to believe that it is or may contain a petroleum product.

(iv) require the production of any licence, permit, records or other documents prescribed in the Environmental Code, and examine and make copies of it.

(i) An inspector may give instructions orally or in writing to any person with respect to any matter in order to bring compliance with the enabling legislation and the Environmental Code and may require that the instructions be carried out in a time frame specified by the inspector.

(j) When a person requests that the inspector put the instructions in writing, the inspector shall do so.

A.1.5.2 Acceptances

Installer licensing

(a) A person may apply for an installer's licence by completing and delivering to the authority having jurisdiction an application on a form provided by the authority having jurisdiction.

(b) The authority having jurisdiction, if satisfied that the applicant has the necessary qualifications, may issue to the applicant an installer's licence.

(c) The design, modification, repair, installation and maintenance of impressed current cathodic protection systems shall be conducted by a registered corrosion expert whose qualifications are acceptable to the authority having jurisdiction.

(d) An applicant for an installer's licence shall submit with the application a certified copy of a policy of comprehensive general liability insurance for a term of at least one year commencing on the date of issue of the licence, providing coverage that is acceptable to the authority having jurisdiction in an amount of at least one million dollars ($1,000,000) for all acts for which the applicant may become legally liable as a result of the applicant's business operations.

(e) The holder of an installer's licence shall ensure that all work done by or under the supervision of the holder and all systems installed by or under the supervision of the holder, conforms to the Environmental Code and all other applicable legislation.

(f) The authority having jurisdiction if satisfied that the holder of an installer's licence has not complied with this Part of the Code, may:
  (i) cancel the license or,
  (ii) suspend the license, subject to the performing of specified work subject to condition defined by the authority having jurisdiction.

A.1.5.3 Offences and Penalties

(a) Each day during which a violation occurs, shall constitute a separate offence.

(b) Any person who contravenes any provision of the enabling legislation or the regulations is guilty of an offence.

(c) Any person who contravenes a remedial order is guilty of an offence.

(d) The authority having jurisdiction should institute provisions enabling inspectors to issue tickets for non compliance with specific provisions of the Environmental Code including unacceptable inventory control practices, record keeping, cathodic protection system monitoring, leak detection system tests and inspections.

(e) A person guilty of an offence, upon conviction, is liable to a fine of not more than $10,000 or to imprisonment for a term of not more than x years, or both (example from Ontario).

A.1.5.4 Remedial Orders

(a) If an underground storage tank system is:
  (i) operated without being registered, or
  (ii) operated, constructed, installed or altered in violation of the enabling legislation or regulations,

then the authority having jurisdiction may direct the operation or work be investigated or may order the person responsible for the system to terminate the operation of or to make such modifications to the system or the manner of operating the system as the authority having jurisdiction considers necessary.

(b) Where, in the opinion of the authority having jurisdiction a person has violated any provision in this Code, the authority having jurisdiction may issue an order directing that person to carry out, in accordance with directions set out in the order, such clean-up, site rehabilitation or other remedial action or other action as the authority having jurisdiction considers necessary, including the provision of water by means of the installation of a water-supply system or other means.

(c) A person to whom an order is directed under the enabling legislation and regulations shall carry out the order in the manner and within the time period specified in the order.

(d) The authority having jurisdiction may extend the time periods for remedial action as necessary.

(e) If, in the opinion of the authority having jurisdiction, the action taken under this Part by the person responsible is not adequate, the authority having jurisdiction, may verbally or in writing, order the taking of such remedial action as the authority having jurisdiction considers necessary.

(f) If a person to whom an order is directed under this part fails or refuses to comply in whole or in part with the order or part of the order, the authority having jurisdiction, together with the other persons, materials and equipment the authority having jurisdiction considers necessary, may enter upon any land or premises, using the force the authority having jurisdiction considers necessary and may take such further action as the authority having jurisdiction considers necessary to effect compliance with or to carry out the order.

(g) The costs incurred by the authority having jurisdiction while carrying out an investigation or inspection, including, without restricting the foregoing, the cost of providing water and the cost of all persons, materials and equipment employed and of repairing any damage done, shall be the liability of and paid by the person responsible for the system or any person who failed to comply with the orders directed under the enabling legislation.

Appendix B
Explanatory Material

The explanatory notes in this Appendix are intended to clarify the requirements of the Environmental Code or to provide additional relevant information. The bold face reference numbers that introduce each item correspond to the applicable Article or Sentence in the Environmental Code.

B.2.2.2 The registration form prescribed by the authority having jurisdiction will require as a minimum the information outlined in Appendix C. However the authority having jurisdiction may require additional information with respect to a tank system, owner or operator as it sees fit.

B.2.2.3 Tanks shall be identified in such a manner as to enable an inspector to match a tank in the field with the information provided on the registration form. Tank identification tags and registration forms should display the emergency telephone number to be called in case of a leak or spill.

B.2.3.2 See B.2.2.3.

B.4.3.1 The single wall tank standards permitted are identical to those in the NFC for underground storage tanks. The exception provided in Article 4.2.1 is when a secondary containment system using double wall tanks is required. Presently there are no double wall tank standards, except as provided in Article 4.3.2.

B.4.3.2 There are no recognized standards for double wall storage tanks in Canada. As an interim measure, this code establishes that the inner tank wall shall be built in conformance with existing recognized single wall tank standards. Interstitial leak detection which shall detect a leak in either of the tank walls is essential if product releases to the environment are to be prevented.

B.4.4.1 Improper installation has been a major cause of underground storage tank system failures (leaks). By requiring approved installers, the tank owner and the authority having jurisdiction can expect an acceptable quality of installation. The approved installer should bear ultimate responsibility for the quality of the work.

B.4.4.7(2) After having done the complete system test as required in sentence 4.4.7(2), it is good practice to leave the system pressurized during the backfilling process to enable detection of any damage or leaks that might occur during backfilling.

B.4.4.8 Abandonment in place of out-of-service storage tanks is not normally an acceptable practice. Storage tanks should not be located near or under building foundations or in locations where the removal of the storage tank would be impractical.

B.4.5.2(1) The ULC standard CAN4-S603.1M Standard for Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids, and cathodic protection of tanks have recently been reviewed by a panel of corrosion experts. The panel of corrosion experts agreed on a number of recommendations. The major points are incorporated in clauses 4.5.2(1) through 4.5.2(4). These recommendations and several others will be considered by the ULC Committee on Stationary Steel Storage Containers for Flammable Liquids for inclusion in the next edition of the standard CAN4-S603.1M.

B.4.5.3(1) Stray current from an impressed current system can cause corrosion to tanks protected by sacrificial anodes. Consequently, bonding of sacrificial anode protected tanks and piping into the impressed current system is necessary.

B.4.5.3(3) The anodes on a CAN4-S603.1M, cathodically protected tank are designed to protect the tank only. Inadequate corrosion protection of CAN4-S603.1M cathodically protected tanks can occur if the tank is not electrically isolated from the piping or other tanks. This appears to be a commonly encountered fault and needs to be emphasized to installers.

B.4.6.3 An expert corrosion panel concluded that all steel underground piping is subject to corrosion. Galvanized pipes do not have sufficient zinc coating to achieve long term corrosion protection.

B.4.8.5(2) Even with the present mechanical type line leak detectors, a line leak within a submersible pump system can result in large volumes of product being pumped into the ground. Leaks from submersible pump systems have been the cause of some of the largest environmental and safety incidents. Where line leak detectors are used, they shall not be by-passed when problems are encountered with dispensing product.

The authority having jurisdiction may choose to prohibit the use of remote or submersible pump systems unless the pipes and pumps are within an acceptable secondary containment system.

B.5.3.1 The tank age combined with a knowledge of the corrosive tendencies of the soil or backfill around the tank provides at present the best predictive indicator of when a tank might leak. Consequently, the use of soil aggressiveness analysis as outlined in Appendix D is provided as a means of establishing the priority or time frame for tank system replacement or upgrading. If an owner is responsible for a large number of tanks, then following such procedures may be economically attractive.

The use of a soil aggressiveness analytical method requires that some samples and analysis of the soil be conducted. This is normally done by a trained technician and there is a cost involved. Even with the soil analysis there is no guarantee. The results will relate to probability.

For many owners, particularly those owning a small number of tanks, a simpler but generally less accurate replacement program based on the tank system age may be the most economical.

B.5.3.4 Once the life of a tank has reached 25 years, there is a reasonable probability that it will develop a leak. The tank can be considered to have completed its useful life and must be replaced rather than upgraded.

B.5.3.6(1) Recent surveys indicate that 20-30% of the existing CAN4-S603.1M tanks may not meet the currently accepted corrosion protection criteria for various reasons essentially related to installation problems. Therefore, existing CAN4-S603.1M tanks shall be tested for adequate cathodic protection. Where adequate protection is not indicated, corrective action in conformance with Section 4.5 is required.

B.5.5.1(1) The addition of sacrificial anodes to existing unprotected steel tanks, except CAN4-S603.1M tanks that are below standard in performance, is not an acceptable upgrading method because of the high current requirements for such tanks.

B.5.6.1(1) The use of internal lining shall be permitted, but tank lining by itself is not considered to be an acceptable upgrade because the tank will continue to corrode on the exterior to the point that the structural integrity of the tank may be lost. Cathodic protection is required when tanks are upgraded with a lining.

Provisions are included to ensure that internal linings are installed to a satisfactory standard. A tank shell that is perforated may not be lined because the tank may have lost product and its structural strength is unknown. A perforated tank shall be removed by the owner.

B.5.7.4(1)(2) Haulers of waste oil for recycle or disposal at present insert a suction hose into the tank to pump out the oil. This practice can damage fiberglass reinforced plastic tanks and can lead to spills when the suction hose is removed. To avoid this, waste oil tanks shall be fitted with a drop tube and a leak tight coupling.

Waste oil haulers should find this method preferable because it is less messy. A removable suction tube is required to enable handling of a plugged suction tube.

B.5.7.5 Liquid and vapour tight connections reduce the possibility of large spills occurring when a tank is incorrectly dipped immediately prior to dropping product in the tank. In such a tank overflow situation, the amount of spilled product can be confined to the amount contained in the delivery hose. Vapour tight connections also reduce the amount of volatile hydrocarbons given off to the atmosphere. This is desirable from a health, safety and environmental perspective.

B.6.5.3(1) The NFC requires that vehicle operators shall remain in close proximity to the discharge control valve. There is concern that vehicle operators may interpret 'close proximity' to include sitting in the cab of the tank vehicle, out of sight of the delivery point. Many overfills occur because the tank vehicle operator is not observing the filling operation and is unaware that the tank is overfilling. Therefore Article 6.5.3 is more specific and requires the vehicle operator to be more attentive.

B.6.6.1 To facilitate prompt contact with the authority having jurisdiction in the case of leaks or suspected leaks, it is recommended that an environmental emergency reporting number be used for reporting. The emergency phone number should be prominently printed on any tank identification tags or tank registration forms or inventory control forms approved or issued by the authority having jurisdiction.

B.6.7.1(1) To date, the only vigorous, unbiased evaluation of leak testing technologies has been at the U.S. Environmental Protection Agency's test facility in Edison, New Jersey. To protect tank owners and the authority having jurisdiction from manufacturers with unsupported performance claims, the performance results and the performance levels stemming from a recognized testing facility will be the only ones recognized.

B.6.7.3 Air and nitrogen pressure tests shall not be considered acceptable for testing existing tanks once the tank has contained product. This is because such pressure tests are too inaccurate to reliably detect small leaks using the maximum allowable pressure for the tank of 35 kPa (5 psi). There is also risk of an explosion.

B.6.7.4 Nitrogen gas pressure testing of lines is sufficiently accurate because the lines are of smaller volume and higher pressures are used. It is required to have the lines exposed so they can be 'soaped'.

B.7.2.3(1) An impressed current cathodic protection system only provides protection against corrosion when it is on and maintained. To avoid corrosion problems, on unoperational tanks, the impressed current system should be left on and maintained.

B.7.3.1 This Article is similar to the NFC Subsection 4.10.3 except that tanks shall be removed after being out of service for more than two years and not five years as stated in the NFC. Tanks out of service more than two years have seldom been re activated in the past.

B.7.4.4(1) Foam should not be considered an acceptable inert material.

Appendix C Minimum — Information Required for Registration of Underground Storage Tank Systems

C.1 The registration form prescribed by the authority having jurisdiction shall require as a minimum, the following information:

(a) name of owner,
(b) address of owner,
(c) type of facility,
(d) location of tanks (if different than address of owner),
(e) storage capacity of tank,
(f) type of product stored,
(g) year of installation,
(h) type of tank (material),
(i) type of piping (material),
(j) corrosion protection provided (if applicable),
(k) type of pump,
(l) name of operator (if different than tank owner), and
(m) name of land owner (if different than tank owner).

Appendix D
Soil Aggressiveness Analysis Procedures

When an owner chooses to use soil agressiveness analysis to establish upgrading or replacement criteria and conditions, this appendix specifically becomes a legal part of the Environmental Code

D.1 Complete a life expectancy analysis within 2 years of the date this Environmental Code is adopted by the authority having jurisdiction using the Warren Rogers Method, the PACE method or another acceptable method for soil aggressiveness analysis.

D.2 If the PACE method of tank life expectancy analysis is used, then the following criteria shall apply.

- (a) if the Tank/Soil (T/S) index of the tank is 180 or greater, then the tank shall be removed within two years of the tank life expectancy analysis,
- (b) if the T/S index is greater than 69 and less than 180 then the tank shall have a leak detection test annually until upgraded, removed or replaced and add leak detection and such work must be completed before the T/S index reaches 180;
  upgrading of the tank shall only occur provided it has greater than five years of tank life expectancy left before the T/S index reaches 180;
- (c) if the T/S index is less than 69 upgrading or replacement is not required until the T/S reaches 69 unless specified by the authority having jurisdiction

D.3 If the Warren Rogers Method of tank life expectancy analysis is used, then the following criteria shall apply.

- (a) if the probability of leak is 25% or greater, conduct a leak test within 60 days of the life expectancy analysis then the tank shall be removed within two years of the tank life expectancy analysis;
- (b) if the probability of leak is greater than 5% and less than 25% then the tank shall have a leak detection test annually until upgraded, removed or replaced and add leak detection and such work must be completed before the probability to leak reaches 25%; upgrading of the tank shall only occur provided there is greater than five years before its probability to leak reaches 25%;
- (c) if the probability of a leak is less than 5% then upgrading or replacement is not required unless specified by the authority having jurisdiction.

D.4 In conducting tank life expectancy analysis, soil samples shall be collected in the manner prescribed by the analytical method used, unless the authority having jurisdiction approves an alternative manner. In all cases the soil sample shall be taken at the level of the tank bottom if the groundwater level is expected to be near or above the bottom of the tank

Appendix E
Secondary Containment Specifications

E.1 Sentence 4.2.2(1) provides that acceptable secondary containment shall be employed at all new installations at Class A sites.

E.2 An implication in this Environmental Code is that the authority having jurisdiction shall determine what technologies or products constitute acceptable secondary containment

E.3 At present there are no nationally recognized standards or specifications that provide the authority having jurisdiction with guidance in assessing what is acceptable secondary containment. Consequently, the following points are provided to serve such purposes:

- (a) Double walled tank
  - (i) As a minimum, the internal wall of a double wall tank shall be designed and built in conformance with one of the Standards provided in Article 4.3
  - (ii) The outer wall shall cover at least the bottom eighty (80) percent of the tank
  - (iii) The outer wall of a steel tank shall be of a minimum thickness of ten (10) gauge
  - (iv) There shall be no penetration of any kind through the jacket to the tank, except for top entry manholes and fittings required for filling, gauging and venting of the tank and monitoring the interstitial space.
  - (v) An interstitial leak detection system that is capable of detecting a perforation, or non-tightness in either wall of the tank, including the entry of water into the interstitial space
  - (vi) The interstitial space shall be tested, in accordance with the instructions of the tank manufacturer, or as a minimum at least annually
  - (vii) If a vacuum system is used, the system shall be capable of maintaining the vacuum of at least 35 kPa for 12 months.
- (b) Vaults
  - (i) A vault shall be water tight, impervious to leakage of petroleum product and able to withstand chemical deterioration and structural stresses from internal and external causes.
  - (ii) The vault shall be a continuous structure with a petroleum product resistant waterstop and joint.
  - (iii) The tanks within the vault shall be supported, encased or bedded in a manner consistent with acceptable engineering practices
  - (iv) The vault shall have an interstitial leak detection capable of detecting product leaks and the intrusion of water into the vault
- (c) Impervious underlayment
  - (i) An impervious underlayment may be used under a tank at sites where groundwater levels are below the bottom of the excavation and where soils are well drained. This underlayment must have a permeability rate to water equal to or less than 1×10^{-7} cm/s and shall not deteriorate in an underground environment and in the presence of petroleum. The underlayment may consist of a synthetic membrane or any equivalent material. If a synthetic membrane is used, any seams, punctures or tears shall be repaired prior to backfilling.

(ii) The underlayment shall extend to the surface and at least 300 mm beyond the sides and ends of the tank and shall have a slope to the sump of at least 20 mm per meter. An observation well shall be centrally positioned in the sump and extend to the surface of the excavation for the purpose of sampling for leakage and pumping out water or product which may accumulate.

(iii) Surface waters shall be drained from the site using good engineering practices. This may include capping the site with asphalt, concrete or another impervious cover which is sloped to drainways leading away from the storage tanks.

(iv) The interstitial space shall be monitored by a leak detection system capable of measuring product releases from the tank.

Appendix F
Leak Detection

F.1 Acceptable leak detection may include the following types of technology

(a) automated, frequent to continuous tank gauging system, capable of performing daily reconciliation,

(b) manual inventory control data that is statistically analyzed on at least a daily basis,

(c) secondary containment with interstitial monitoring, which includes double wall tanks,

(d) soil gas or vapour monitoring systems,

(e) hydrocarbon monitoring,

(f) other technologies acceptable to the authority having jurisdiction

F.2 Rigourous performance standards have not been fully developed. The authority having jurisdiction can be expected to amend the performance standards and the acceptable technologies in the future as further information and research results become available.

THE FEDERAL FACILITIES UNDERGROUND STORAGE TANK MANUAL

Frank D'Addario, Environmental Officer,Ottawa District Office
Environmental Protection, Ontario Region, Environment Canada

The Management of Underground Storage Tanks Containing Petroleum Products at Federal Facilities in Ontario

Prepared for Environment Canada

by Frank D'Addario

March 1991

Introduction

Next to PCB's, leaking underground storage tanks systems (LUST) have been the most discussed environmental issue for at least the last five years. There are approximately 15 000 underground storage tanks located at federally-owned or leased facilities across Canada. It has been estimated that 10–15% of these existing underground tanks are leaking. Therefore proper management of these storage tank systems is very important. Leakage from an underground storage tank (UST) can cause an environmental, fire, or health problem. One gallon of leaked gasoline fuel product has the potential to contaminate one million gallons of aquifer water.

Manual Format

The organization and layout of this manual is described by the flowcharts attached. Extensive use is made of "flowcharts" both to simplify the explanation of steps to be followed as well as to reduce the manual length. While this manual outlines the broad requirements of government documents, it is not intended to provide an exhaustive description of requirements or interpretation of government legislation, regulations and guidelines.

The manual was formatted in such a way as to allow for regulatory changes or changes in technical requirements to be made quite easily. Therefore, the manual can easily be adapted for use in different regions of Canada, and it is the long-term goal of Environment Canada to provide a similar manual for each region of the country. The manual was prepared in accordance with the Environmental Code of Practice For Underground Storage Tank Systems containing Petroleum Products 1989, CCREM '89. This document will be referred to as 'ECP-'89' throughout the rest of the manual.

The manual was initiated because of the overwhelming number of calls the Ontario Region, office of Environment Canada was receiving with regards to tank management and leaking underground storage tanks.

The presentation today will consist of a series of flowcharts. These flowcharts will hopefully carry the federal facility manager or tank owner through a systematic series of steps so that they may properly manage their tank systems.

The presentation will provide an overview of the UST manual and will key in on certain important issues.

Part 1 – Registration

All USTs must be registered with Environment Canada, Federal Programs Branch, Place Vincent Massey, 351 St. Joseph Blvd, Hull, Quebec.

Registration with the Ontario Fuels Safety Branch is recommended, but not required.

Part 2 – Site Assessment / Site Classification

The federal facility operator/manager is responsible for the implementation of a site assessment evaluation, this may be conducted by in-house staff or by contracting out to a qualified expert to perform the site assessment. The purpose of this site assessment is to determine the site classification (A, B, or C) for that particular federal facility. All installation sites must be classified according to the ECP-'89 Part 3 prior to installing underground storage tanks on federally owned property. If a federal facility site has not been classified, ie. no site assessment report, it will be assigned a class 'A' site. The onus is with the federal department to provide Environment Canada with a site assessment report. Environment Canada during routine auditing activities will require site assessment reports, and upon reviewing the site assessment report can reclassify the site based on their own evaluation of site sensitivity.

Sites must be classified as Class A, B or C. Class A sites are considered most sensitive and Class C sites are considered the least sensitive. In conducting a proper site assessment the use of bore holes and monitoring wells are required. A thorough and complete site assessment should include the following:

1. Geology Data
   - Surface topography
   - Type of soils – Sand, loam clay
     - Depth of soil
     - Depth to bedrock
     - Stratigraphy
   - Soil moisture (saturated/damp/dry)
   - Soil pH (acidic/basic/neutral)
   - Soil aggressiveness and soil resistivity

2. Hydrogeology Data
   - Water table level (high or low, gradient, direction, velocity)
   - Groundwater flow (quantity and quality)
   - Location of aquifer, spring, etc.
3. Socio–Demographic Data
   - Population density
   - Surrounding land use
   - Buried services (water mains, storm and sanitary systems, gas and electrical installations)
   - Buildings and confined spaces
4. Environmental Sensitivity Data
   - Proximity to water bodies (surface), wells, wetlands or any sensitive ecological habitat Flora and Fauna.
   - Use and significance of existing groundwater and groundwater supplies

Sites for both existing and proposed underground fuel tank systems must be assessed and classified according to their sensitivity for potential impact on the environment and on human health and safety. A site investigation/assessment is not required if the federal facility assumes this site to be a Class A.

The table below describes the site characteristics which determines site classification.

Table 1: Site Classification

Classification	General Characteristics
A	• Sandy soils • High water table • Groundwater quality and use is high • Considered a sensitive environment, high population density • May or may not have buried services • Water wells are used for drinking, etc. • Bedrock is deep A high percentage of sites are Class A.
B	• Mainly sandy soils (loam possible) • High – Medium water table • May or may not have buried services • Site is remote from residential areas • Bedrock is deep
C	• Remote from residential area • Usually have semi–permeable to impermeable clay • Low water table • Site is not environmentally sensitive • No groundwater resource in close proximity • Bedrock is shallow

Part 3 – Installation of New Underground Storage Tanks

The installation of an underground tank system on federal property must meet all requirements specified in government regulations, standards or guidelines.

A facility manager's responsibilities, whether they are done by in–house staff or by contracted services include:

- developing a tank management plan for each tank
- site assessments/site classification
- design of tank installations
- installation of tank and piping systems
- leak detection of the tank and piping system
- removal and disposal of contaminated water and soil
- monitoring and supervising the contractors and/or employees to ensure all work is done in accordance with federal and provincial standards
- developing and implementing a contingency plan to deal with emergency situations involving leaking underground storage tanks
- monitoring the underground storage system
- ensuring that a lessee on federal lands conforms to all requirements for proper tank management in accordance with government regulations/standards and codes
- estimating costs and developing a budget for all aspects related to tank management

The classification of a site, whether it is a Class A, B, or C determines specific equipment requirements with respect to tanks, pipes, and leak detection. In addition, all equipment must conform with Federal Standards. These requirements are summarized by the table 2 below. Note that Class C equipment configurations are rarely used in practice.

Installation Procedures

Installation of fiberglass or metal tanks must be in conformance to the manufacturer's installation instruction. Fiberglass underground storage tanks are now commonly used for storing petroleum products because they are not susceptible to corrosion but special care must be taken during the installation process. Fiberglass tanks do not offer the tensile strength of metal tanks.

The following summarizes the proper installation procedures:

- The excavation should be deep enough to provide for the required depth of burying below grade, and to provide for the required backfill below tank bottom.
- If necessary, prepare a reinforced concrete slab at the bottom of the excavation for anchoring purposes.
- Lower the tank into the excavation using lifting lugs.
- In excavation with high water tables, anchor the tank using factory installed anchor straps placed in designated ribs only.
- Choose the proper backfill material as per manufacturer's specifications (must be free of debris and other organic matter).
- Compact the backfill material to ensure adequate support.
- Obtain results of all testing done during installation. (cathodic protection requirements, tank testing).

Prior to backfilling, leak test the complete system.

- The entire system to be subjected to a 15 minute, 5 psi air pressure test.
- Be sure to soap all connections and
- the pressure should be measured by an instrument calibrated in increments not greater than 0.15 psi.

Some factors that interfere with standard installation procedures are:

- high water table
- presence of bedrock
- existing cables
- availability of space
- unstable soil
- frost

Table 2: General Equipment Requirements

	Class A	Class B	Class C
Tanks (General Construction)	ULC Standard Double Walled Steel or Fiberglass Reinforced Plastic Tanks	ULC Standard Single Walled Steel or Fiberglass Reinforced Plastic Tanks	ULC Standard Single Walled Steel or Fiberglass Reinforced Plastic Tanks
Secondary Containment	Required, with Interstitial Leak Detection	Not Required	Not Required
Over Fill or Spill Protection Device	Required	Required	Not Required
Cathodically Protected Steel or Fiberglass Reinforced Plastic Tank	Required	Required	Required
Leak Detection	Required, for Secondary Containment	Required	Not Required
Vent Pipes/Piping (General)	Conform with NFC	Conform with NFC	Conform with NFC
Connected to Heating Appliance ie. Boilers	Must Conform with CSA Standards B139	Must Conform with CSA Standards B139	Must Conform with CSA Standard B139

Part 4 – Upgrading Existing Tank Systems

Upgrading Schedule

This part applies to all underground storage tank systems containing petroleum products installed prior to January 1 of 1989. Unprotected underground steel tank systems at all federal facilities must be upgraded or replaced as determined by the schedule outlined in Table 3 below.

When an underground petroleum fuel storage tank is upgraded or replaced, all remaining unprotected steel tanks and piping at that specific location must be upgraded within 180 days.

Existing unprotected steel or galvanized pipe connected to protected or fiberglass reinforced plastic tanks must have cathodic protection by 1993 for Class A and B and 1994 for Class C sites.

All existing underground tank systems that are cathodically protected by sacrificial anodes, should be tested for cathodic protection voltage potentials every year. If the measured cathodic voltage is less than 850 millivolts negative to a copper/copper sulphate reference then corrective action must be taken as necessary. All existing protected tanks at Class A and B sites should have acceptable leak detection installed and operational within 2 years of the site being designated either a Class A or B site. All existing piping should be leak tested whenever the associated tanks are tested.

Upgrading Option

Existing unprotected steel tank systems and associated pipes must be upgraded by:

- replacement of the tank in conformance with the installation procedures and manufacturers installation instructions.
- installation of cathodic protection system
- an impressed current cathodic system designed and installed in accordance with specifications and instruction of a corrosion expert, or designed and installed in conformance with PACE 87-1 or
- the addition of sacrificial anodes

Internal Tank Lining

An internal lining is permitted to be installed as a means to prevent internal corrosions of an underground storage tank, provided that:

- after internal sand blasting cleaning, the storage tank is not perforated,
- the installation of the internal lining is under the direction of the lining manufacturer or certified representative.

Overfill / Spill Protection

At the time that an UST system at a designated Class A or Class B site is upgraded by the addition of leak detection, overfill or spill protection must be provided in the form of either:

- a catchment basin (spill protection device), or,
- an overfill protection device

Underground storage tanks connected to heating appliances under the CSA Standard B-139 do not require overfill or spill protection, but, vent alarms are required. (For Class A and B sites only)

Waste oil tanks are not required to have overfill or spill protection devices but must have removable suction tubes installed before 1991 (For all sites classes A, B, and C).

Table 3 Year Upgrading Schedule Required for Unprotected Steel Tank System

Tank Age (Years since Original Installation)	Class A and Class B Sites (Replace or Upgrade, and Add Leak Detection)	Class C Sites (Replace or Upgrade)
Unknown	1991 (Replace only)	1993 (Replace only)
25 or older	1991 (Replace only)	1993 (Replace only)
20 – 24	1992	1994
15 – 19	1993	1995
10 – 14	1993	1996
5 – 9	1994	1997
0 – 4	1994	1998

Part 5 – Operation and Maintenance

Product Monitoring

Regular monitoring activities are used to determine as early as possible which underground storage tank(s) may be leaking. Monitoring can assist in the early detection of product losses which can:

- minimize or avoid environmental contamination from leaking underground tanks and piping
- reduce the safety concerns of gasoline vapours originating from leaking USTs and piping.

There are 2 major stages involved in monitoring USTs.

Stage 1

Perform regular monitoring such as:

- dipstick measurements
- daily and monthly reconciliation
- cathodic protection measurements
- leak prediction tests (PACE Method / Warren Rogers) Referenced in Environment Code of Practice (CCRME) '89
- Product delivery slip

If monitoring activity results indicate possible leakage of tank contents.

Stage 2

- Use leak detection tests to confirm that there is a leak

The most commonly used inventory monitoring device is a dip-stick. Today, there are a number of electronic-based systems designed to improve inventory tank management. These tank level sensing systems are designed to continuously monitor inventory levels and track fuel dispensing and deliveries.

The proper use of a dip (gauge) stick is an essential element in inventory control.

Tank operators must maintain a daily record of overages and underages. These records can provide a means of early detection of suspected product loss.

Leak Testing and Detection

Leakage from an underground petroleum tank can cause an environmental, fire and health problem.

An underground tank leak testing system must be capable of detecting:

- a loss of product or a gain of water of less than 0.380 litres / hour with a probability of detection equal to or greater than 0.99 and a probability of false alarm equal to or less than 0.01 and
- be conducted by a registered testing specialist.

The precision leak test report must contain as a minimum the following information.

- tank registration number,
- location of test
- date of test
- results of test
- test methods
- certification by testing specialist that the test complies with acceptable procedures and
- name and address of testing agent

Air or nitrogen testing of piping is considered an acceptable precision leak test provided the testing is conducted in conformance with the National Fire Code, section 4.4.6.

Procedure to follow when pressure testing single-walled tanks with air are as follows:

- Pressure test tanks with 3–5 psig air pressure, making sure that all surfaces, seams and fittings are soaped.
- Consult manufacturers instructions for specific recommendations for testing.
- Air tests are inconclusive without soaping and a careful inspection for bubbles.
- A pressure relief device is recommended to prevent over pressurization.
- Never air test over 5 psig

For double-walled tanks the procedures involved in testing the interstitial vacuum are as follows:

- pressurize the inner tank to a maximum of 5 psig. Seal the inner tank and disconnect the external air supply.
- Monitor the pressure for a period of one hour. This step is recommended to detect a very large leak in the inner tank and to prepare for the next step.
- Pressurize the interstitial area with air from the inner tanks.
- Use a second gauge for measuring pressure in the interstice.
- Soap the exterior of the tank and inspect for bubbles while continuing to monitor the gauges to detect any pressure drop.
- Release the test pressure and vent both spaces.
- Note: Pressurization of the interstice directly from an outside air source is dangerous and prohibited. • A slight decrease in pressure in the inner tank may occur when the interstice is pressurized. A pressure drop of 0.3 psig or less is typical.

Leak testing systems that are currently available and in use are:

- Petro-Tite Tank Tester
- Sun Leak Lokator
- Ethyl Tank Sentry
- Athabaska Research System (Tankology)
- Hydro Static Systems
- Smith and Denison Systems
- EMCO Leak Sensor II and Leak Sensor Jr.
- RONAN Model TRS-76 Leak Detector
- Mollory-Model FD102 Pollulert

Other methods of leak detection which can also provide early detection of leaks include:

- Automated continuous tank gauging systems, capable of performing daily reconciliation
- Monitoring wells
- Soil, gas, or vapour monitoring systems
- Manual inventory control-analyzed on a daily basis with interstitial monitoring, which includes double walled tanks
- Secondary containment
- Product and/or hydrocarbon monitoring
- Human senses (smell, taste)

Record Keeping

The federal facility or owner of a petroleum product storage tank system shall maintain inventory control records and reconciliation data for a period of at least two years.

When there is a change in operator or owner of an UST system, the departing owner shall transfer all the inventory records and reconciliation data to the new owner.

The owner of a petroleum product storage tank system shall maintain records of the following for a period of at least five years.

- cathodic protection voltage measurements
- line leak detection system tests
- leak detection equipment tests and checks
- precision leak test results
- excavation of nearby construction that could affect the integrity of the storage tank system, and
- inspection, tests or maintenance checks of storage tank system equipment.

All records of alterations and upgrading of UST shall be kept for the life of the storage tank system.

Part 6 – Leaking Underground Storage Tanks (LUST's)

Leakages from UST's can lead to unexpected environmental damage if initially, proper procedures involving leak verification, site remediation and site monitoring (post clean-up) activities are not carefully followed.

The federal facility manager or tank owner should investigate any discrepancies in the recorded volume of product in a tank to confirm whether or not there is a leak.

When there is suspicion of a leak from an underground storage tank or piping system, the tank owner should start investigating possible causes of petroleum product loss:

- level of accuracy in the inventory control system
- spills
- cathodic protection records
- inaccurate metering at pumps / dispensers
- Human errors: arithmetic, reconciliation
- Deliveries ie. short deliveries

If this activity does not provide a satisfactory explanation for discrepancies or suspicions, then the facility manager should consult other resources to confirm the presence of a leak and to identify the leak.

Leak Verification

Any federal facility having a storage tank system where a leak is known or suspect must take such actions to verify the leak. Product losses due to a leak can be confirmed by:

- monitoring wells
- vapour detection
- hydrostatic / air test of tanks and pipes

For further background information and details, refer to the publication "Detection, Prevention and Remediation of Leaks from Underground Storage Tanks" (Environment Canada, February 1989).

Site Remediation and Clean–up Criteria

The final step a facility manager or tank owner must take in dealing with a leaking underground storage tank to restore the contaminated site to an acceptable level.

Federal guidelines used for the establishment of clean–up criteria for site decommissioning projects are the CCME Interim Environmental Quality Guidelines for Contaminated Sites, 1991. These guidelines were developed under the National Contaminated Sites Remediation Program. In addition other Federal and Provincial regulations and guidelines are consulted when determining clean–up criterias. Contaminated soil and groundwater levels above the acceptable levels published in the CCME guideline or any other Federal/Provincial guidelines must be treated and/or disposed of accordingly to meet these standards.

The general approach for determining analytical cleanup parameters and for establishing clean–up criteria for water, and soils is described below.

For Soil and Groundwater:

- Based upon composition of fuel spilled or leaked.

  ie. Fuel Oil #2, Gasoline, Aviation Gas, etc.

Step 1 Determine Analytical Parameters for Testing.

- BTEX Test (Benzene/Toluene/Ethylbenzene/Xylene)
- TPH Test (Total Petroleum Hydrocarbons)
- Light Aliphatic Hydrocarbon Test
- Mineral Oil and Grease Test
- Leachate Test

Step 2 Determine assessment criteria to be used. For Federal facilities, the CCME Guidelines are recommended. In addition, where numerical values are not stated, other Federal/Provincial guidelines can be adopted.

Step 3 Decommission the site to the assessment criteria values to ensure proper clean–up.

Leachate Testing Requirements

- Used for municipal landfill purposes.
- Requires testing for mainly inorganic chemicals, metals, PCB's etc.
- Not applicable for soils contaminated with petroleum product, but required for landfill purposes.

Site Monitoring

If contamination of the site is extensive, groundwater monitoring wells will be required to monitor the concentration of leaked product that might be left as residuals in the soil or water.

Temporary Withdrawal of Storage Tanks from Service

If an underground storage tank system is to be withdrawn from service for a period of more than 30 days but less than 180 days the facility manager or tank owner must notify Environment Canada before the storage tank goes out of service. UST's that have been registered with Environment Canada as a tank operating on a seasonal basis is exempt from this activity.

Cathodic protection must be maintained and operated throughout all periods when the storage tank system is withdrawn from service.

Environment Canada must be notified in writing at least seven days prior to any storage tank system being reactivated for use.

Any underground storage tank out-of-service for more than one year must be precision tested before the storage tank is returned to service.

Removal of Storage Tank Systems

UST systems that have contained petroleum products and have no further use or that have been out of service for more than two years must be removed in conformance with the National Fire Code Subsection 4.10.3.

When an underground storage tank system is to be removed from a federal facility by contracted services, removal contract specification must be prepared.

It is the responsibility of the federal facility manager to prepare job specification for services to be contracted, review bids, award contracts and supervise contract implementation.

Part 7 – Abandonment of Storage Tanks

Under normal circumstances a UST should never be abandoned. If a facility manager or tank owner wants to abandon a storage tank he must obtain approval from Environment Canada.

Environment Canada may grant approval if the storage tank system is:

- located in whole or in part beneath a permanent building or facility, and that excavation of the storage tank is not practicable.
- so large of a construction that the excavation of the tank is not practicable.
- inaccessible to the heavy equipment necessary for removal of the storage tank, or
- situated so that removal of the storage tank would endanger the structural integrity of nearby building or other facilities.

and if

- the soil under and around the storage tank has not been contaminated with petroleum product.
- the storage tank has been pressure tested and deemed not leaking.

Once permission has been granted for abandonment, the abandonment procedures for UST must comply with the following:

- tanks shall be purged of vapours to less than 10% of the lower flammable limit, using a combustible gas meter.
- any sludge in the storage tank shall be removed.
- sufficient holes shall be cut along the top of the storage tank to enable the complete filling of the tank with inert material (sand, gravel or concrete)
- a record of the size, description and location of the storage tank submitted to Environment Canada.
- associated piping should be removed from service in conformance with the National Fire Code Subsection 4.10.3.

Reuse and Disposal of Storage Tanks

Underground steel storage tanks may be reused for the storage of petroleum product only after they have been refurbished in accordance with:

- Technical Supplement CAN 4–5603 (A) – June 1987. Refurbishing of Steel Underground Tanks for Flammable and Combustible Liquids.

Fiberglass reinforced plastic storage tanks may be reused only after they have been refurbished in accordance with:

- Technical Supplement CAN 4–5615 (A) – February 1987. Refurbished of Reinforced Plastic Underground Tanks for Petroleum Fuels.

Revited storage tanks should not be reused for the storage of petroleum products.

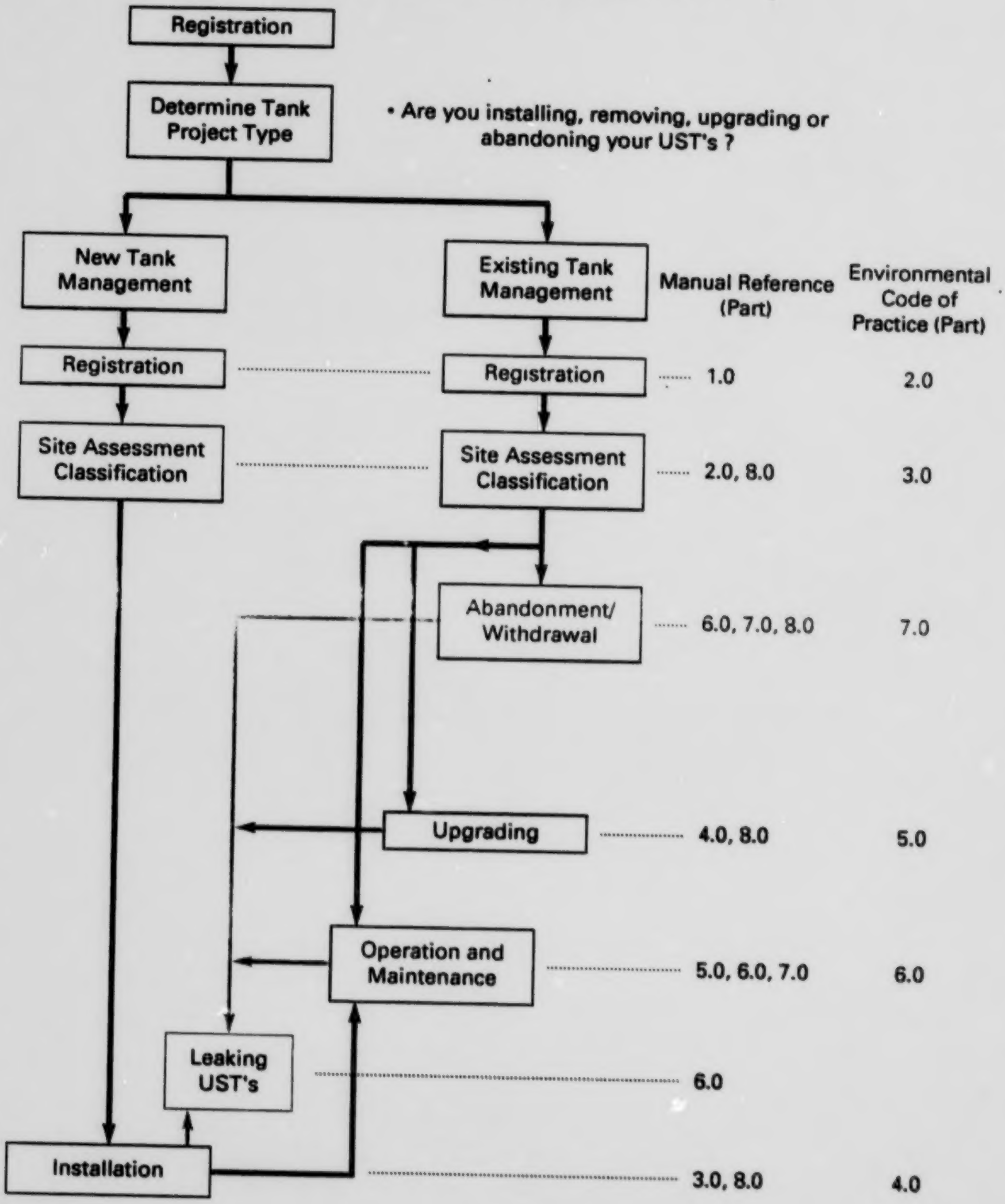
Disposal of storage tanks should consist of cutting sufficient openings on both the sides, after they have been purged of vapours to render them unfit for use.

Management of Underground Storage Tanks Containing Petroleum Products

Extracted UST Manual Flowcharts

- **Overview Flowchart**
- **Part 1 – Registration**
- **Part 2 – Site Assessments and Classification**
- **Part 3 – Installation of New Underground Petroleum Tank Systems**
- **Part 4 – Upgrading Existing Underground Petroleum Storage Tanks**
- **Part 5 – Operation and Maintenance of Underground Petroleum Tank Systems**
- **Part 6 – Leaking Underground Petroleum Storage Tanks (LUST's)**
- **Part 7 – Withdrawal / Abandonment of Underground Petroleum Storage Tanks**

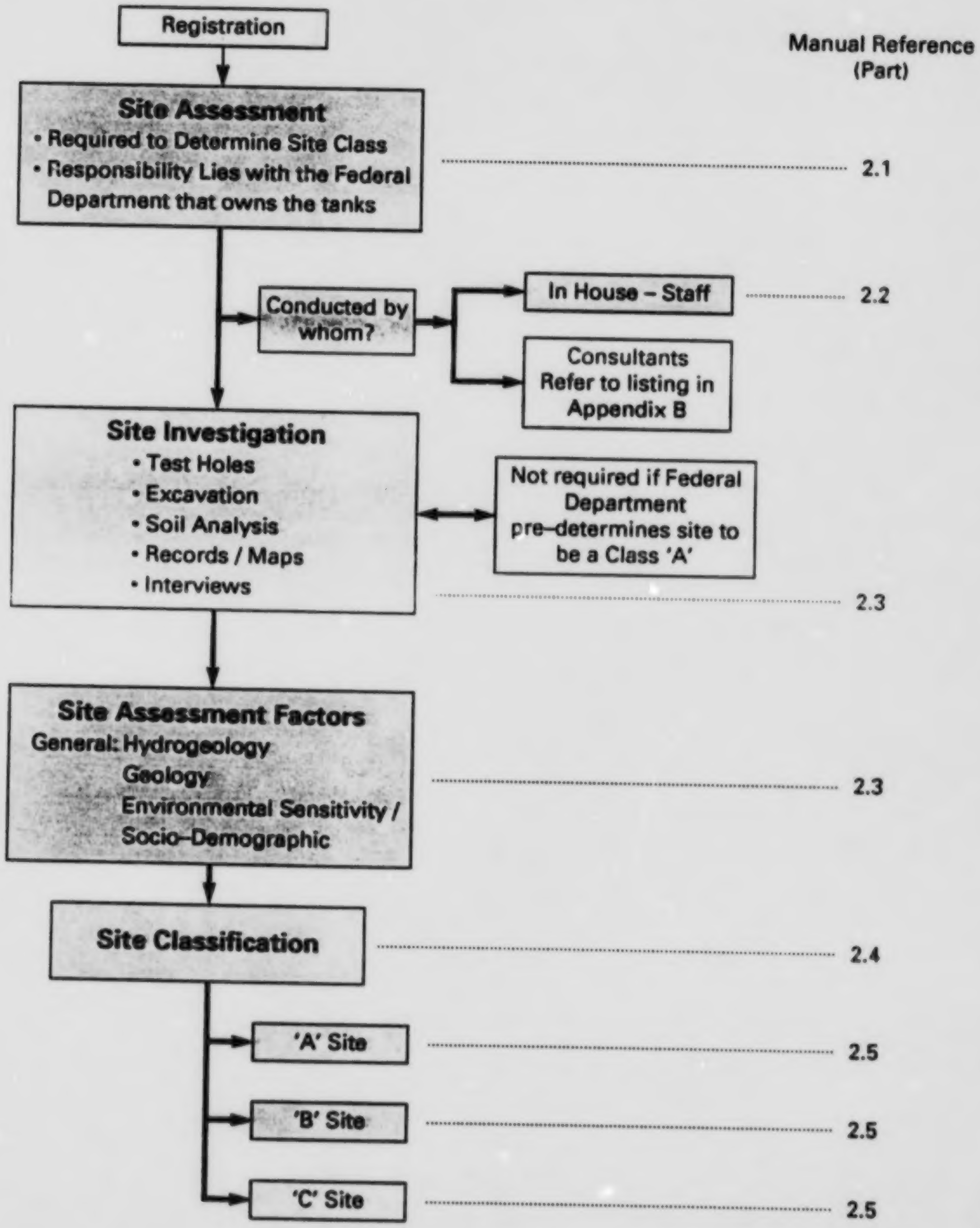
Overview Flowchart: Underground Petroleum Storage Tank Management Procedures and Manual Reference


Registration
Determine Tank Project Type
• Are you installing, removing, upgrading or abandoning your UST's ?
New Tank Management
Existing Tank Management
Manual Reference (Part)
Environmental Code of Practice (Part)
Registration
Registration
1.0
2.0
Site Assessment Classification
Site Assessment Classification
2.0, 8.0
3.0
Abandonment/ Withdrawal
6.0, 7.0, 8.0
7.0
Upgrading
4.0, 8.0
5.0
Operation and Maintenance
5.0, 6.0, 7.0
6.0
Leaking UST's
6.0
Installation
3.0, 8.0
4.0

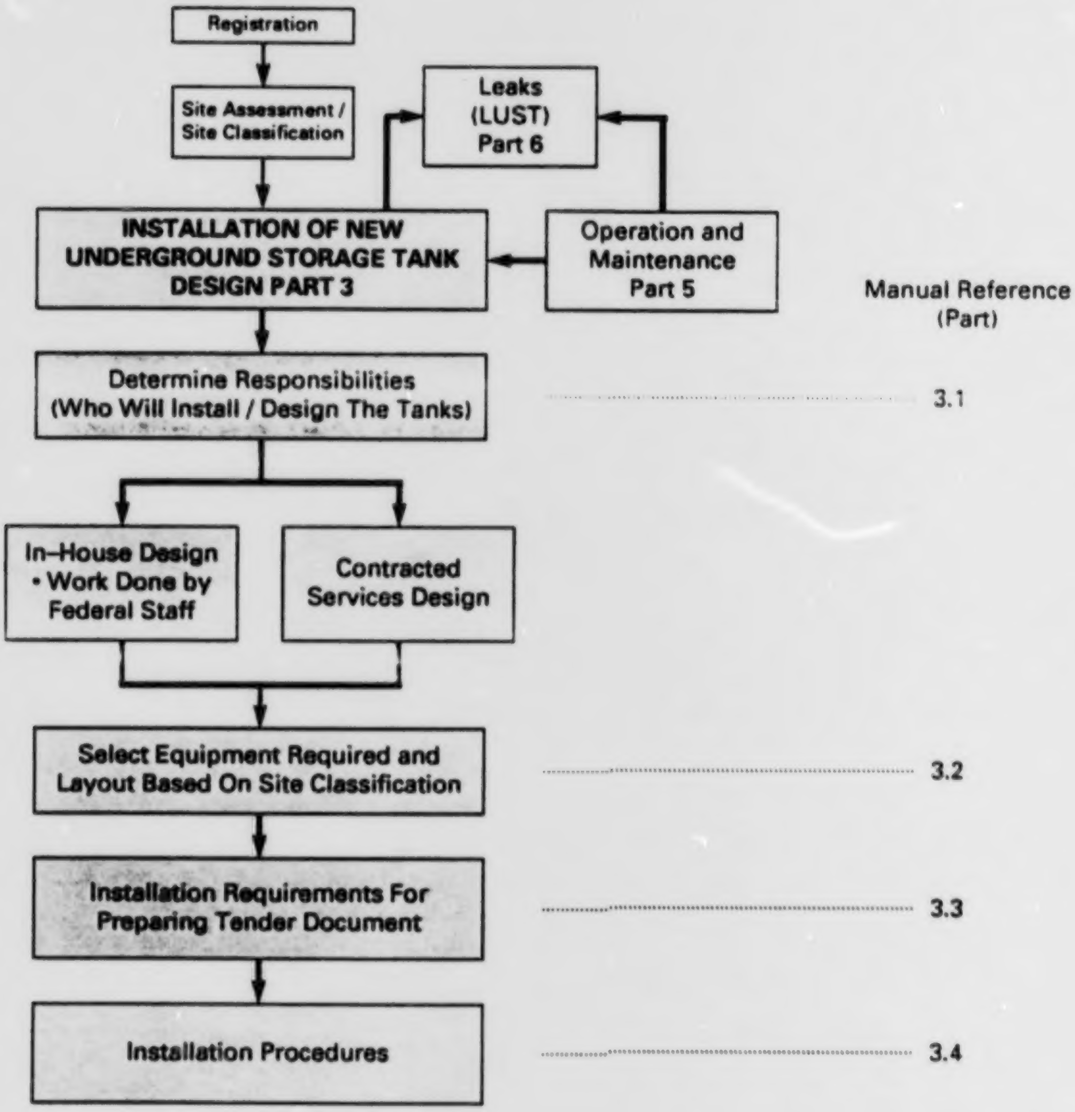
Part 1 – Registration

Questions	
With which department do I register my Underground Storage Tanks ?	**Environment Canada** C & P, Federal Programs Branch Place Vincent Massey 351 St. Joseph Boulevard Hull, Quebec K1A 0H3 Attention: B. Melbourne (819) 953-1697
Where do I obtain copies of registration forms ? **Appendix C** – For a copy of **registration form** and minimum information requirements.	
Do I require registration of existing tanks, as well as new tanks ?	Yes
Do I require registration with the Ontario Fuel & Safety Branch	**Recommended, Not Required**

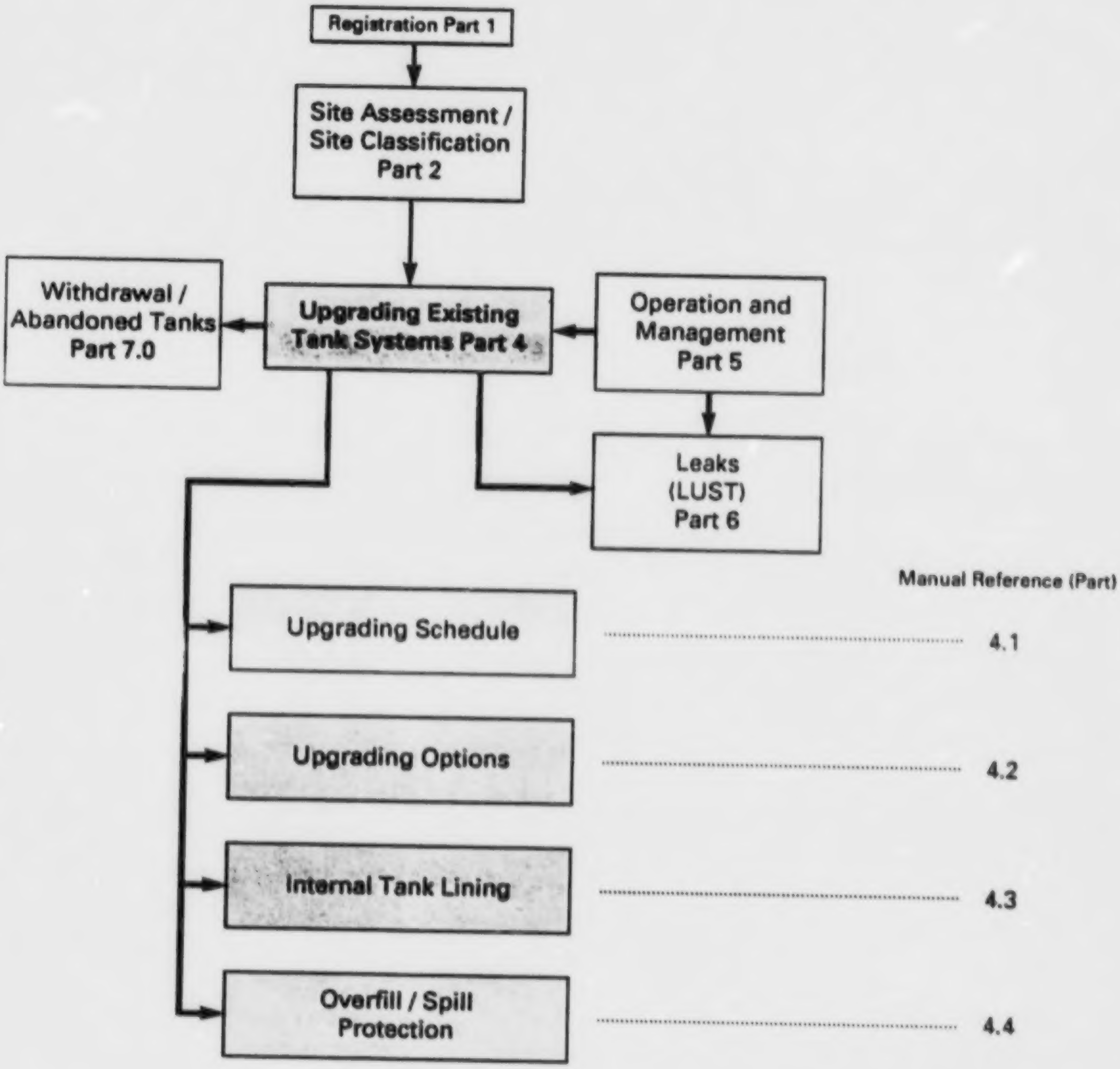
Part 2 – Site Assessments and Classification


Registration
Manual Reference (Part)
Site Assessment
• Required to Determine Site Class
• Responsibility Lies with the Federal Department that owns the tanks
2.1
Conducted by whom?
In House – Staff
2.2
Consultants Refer to listing in Appendix B
Site Investigation
• Test Holes
• Excavation
• Soil Analysis
• Records / Maps
• Interviews
Not required if Federal Department pre–determines site to be a Class 'A'
2.3
Site Assessment Factors
General: Hydrogeology
Geology
Environmental Sensitivity / Socio–Demographic
2.3
Site Classification
2.4
'A' Site
2.5
'B' Site
2.5
'C' Site
2.5

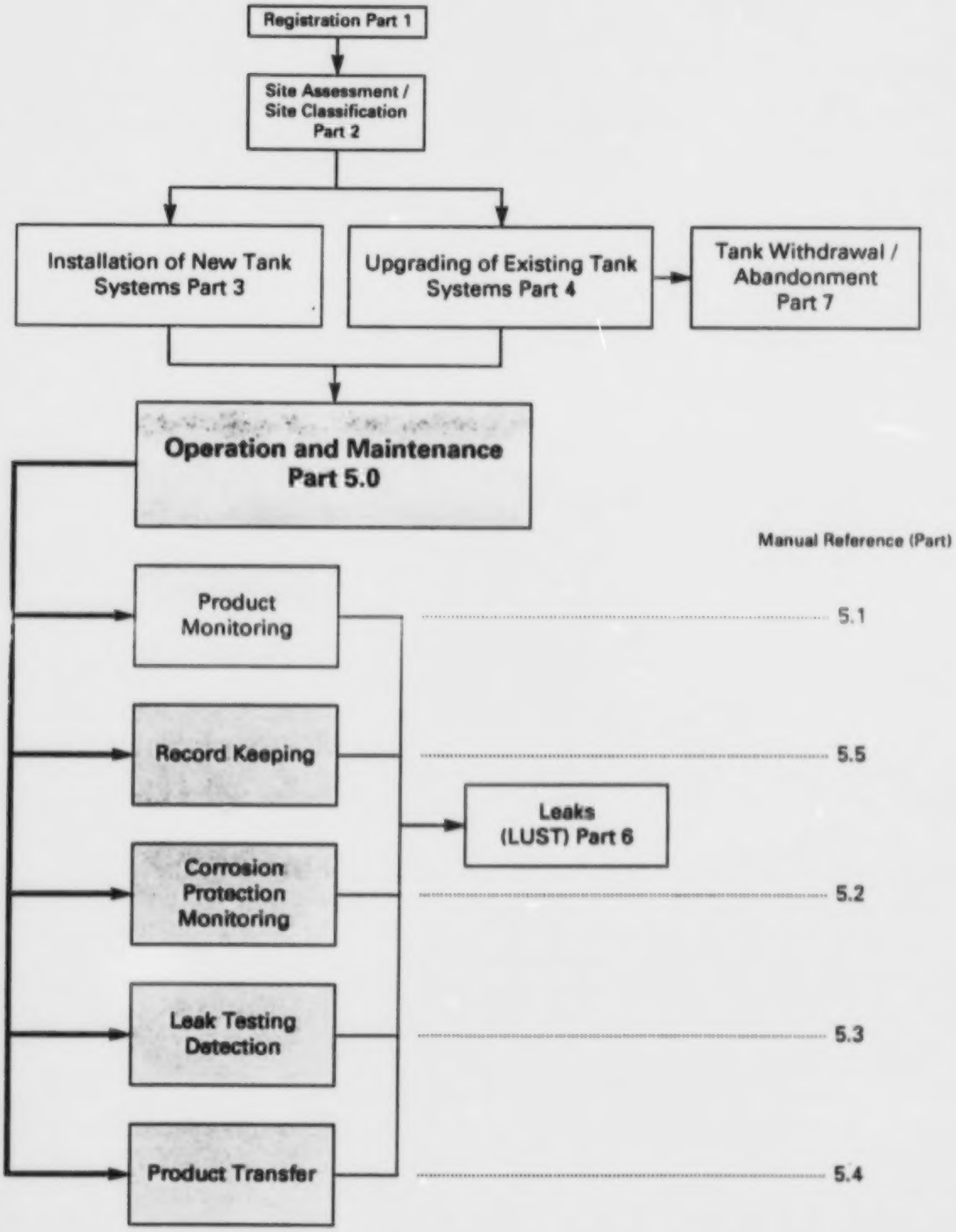
Part 3 – Installation of New Underground Petroleum Tank Systems


Registration
Site Assessment / Site Classification
Leaks (LUST) Part 6
INSTALLATION OF NEW UNDERGROUND STORAGE TANK DESIGN PART 3
Operation and Maintenance Part 5
Manual Reference (Part)
Determine Responsibilities (Who Will Install / Design The Tanks)
3.1
In–House Design • Work Done by Federal Staff
Contracted Services Design
Select Equipment Required and Layout Based On Site Classification
3.2
Installation Requirements For Preparing Tender Document
3.3
Installation Procedures
3.4

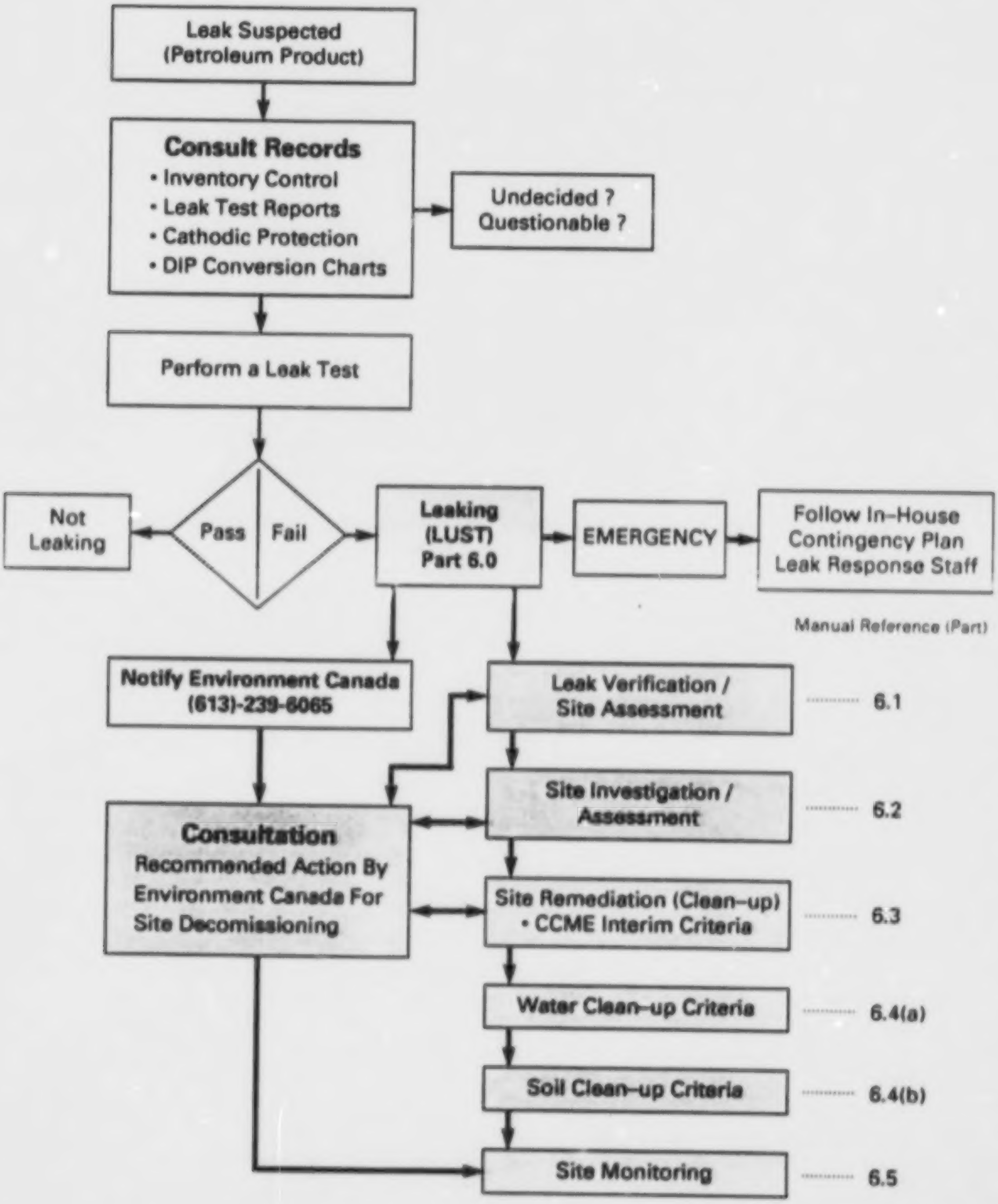
Part 4 – Upgrading Existing Underground Petroleum Storage Tank Systems


Registration Part 1
Site Assessment / Site Classification Part 2
Withdrawal / Abandoned Tanks Part 7.0
Upgrading Existing Tank Systems Part 4
Operation and Management Part 5
Leaks (LUST) Part 6
Manual Reference (Part)
Upgrading Schedule
4.1
Upgrading Options
4.2
Internal Tank Lining
4.3
Overfill / Spill Protection
4.4

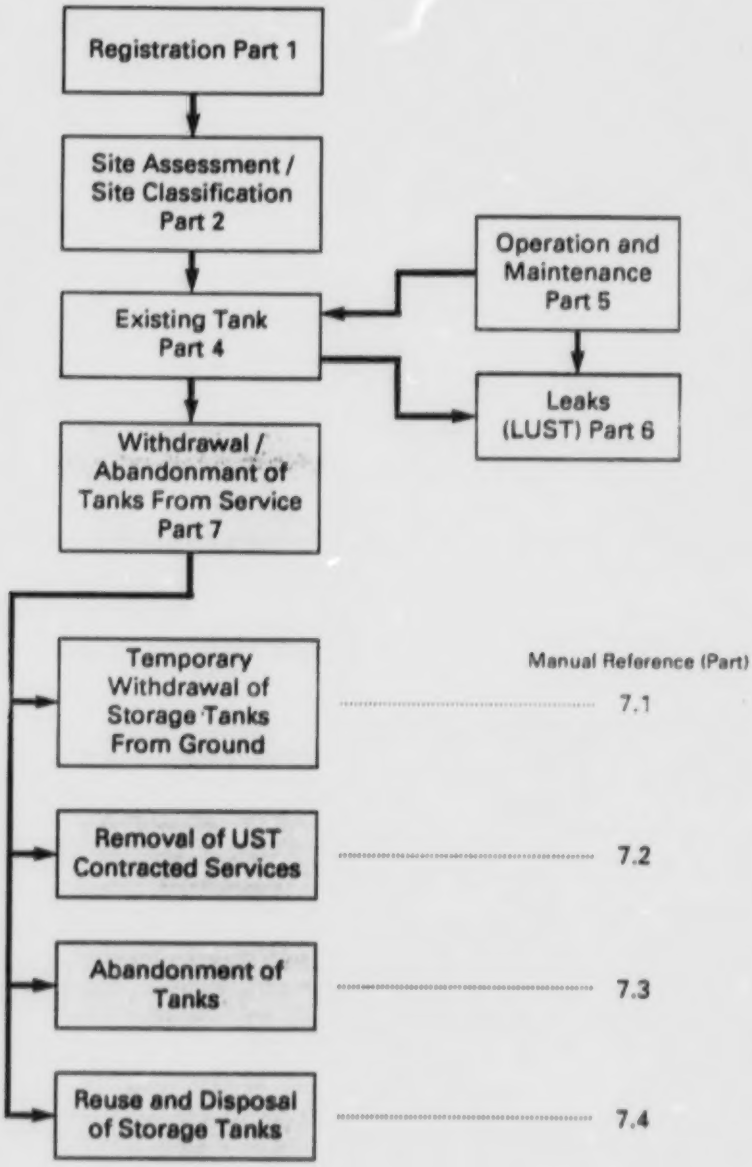
Part 5 – Operation and Maintenance of Underground Petroleum Tank Systems


Registration Part 1
Site Assessment / Site Classification Part 2
Installation of New Tank Systems Part 3
Upgrading of Existing Tank Systems Part 4
Tank Withdrawal / Abandonment Part 7
Operation and Maintenance Part 5.0
Manual Reference (Part)
Product Monitoring
5.1
Record Keeping
5.5
Leaks (LUST) Part 6
Corrosion Protection Monitoring
5.2
Leak Testing Detection
5.3
Product Transfer
5.4

Part 6 – Leaking Underground Petroleum Tanks (LUST's)


Leak Suspected
(Petroleum Product)
Consult Records
• Inventory Control
• Leak Test Reports
• Cathodic Protection
• DIP Conversion Charts
Undecided ?
Questionable ?
Perform a Leak Test
Not Leaking
Pass
Fail
Leaking
(LUST)
Part 6.0
EMERGENCY
Follow In-House
Contingency Plan
Leak Response Staff
Manual Reference (Part)
Notify Environment Canada
(613)-239-6065
Leak Verification /
Site Assessment
6.1
Site Investigation /
Assessment
6.2
Consultation
Recommended Action By
Environment Canada For
Site Decomissioning
Site Remediation (Clean-up)
• CCME Interim Criteria
6.3
Water Clean-up Criteria
6.4(a)
Soil Clean-up Criteria
6.4(b)
Site Monitoring
6.5

Part 7 – Withdrawal / Abandonment of Underground Petroleum Storage Tanks


Registration Part 1
Site Assessment / Site Classification Part 2
Operation and Maintenance Part 5
Existing Tank Part 4
Leaks (LUST) Part 6
Withdrawal / Abandonmant of Tanks From Service Part 7
Manual Reference (Part)
Temporary Withdrawal of Storage Tanks From Ground
7.1
Removal of UST Contracted Services
7.2
Abandonment of Tanks
7.3
Reuse and Disposal of Storage Tanks
7.4

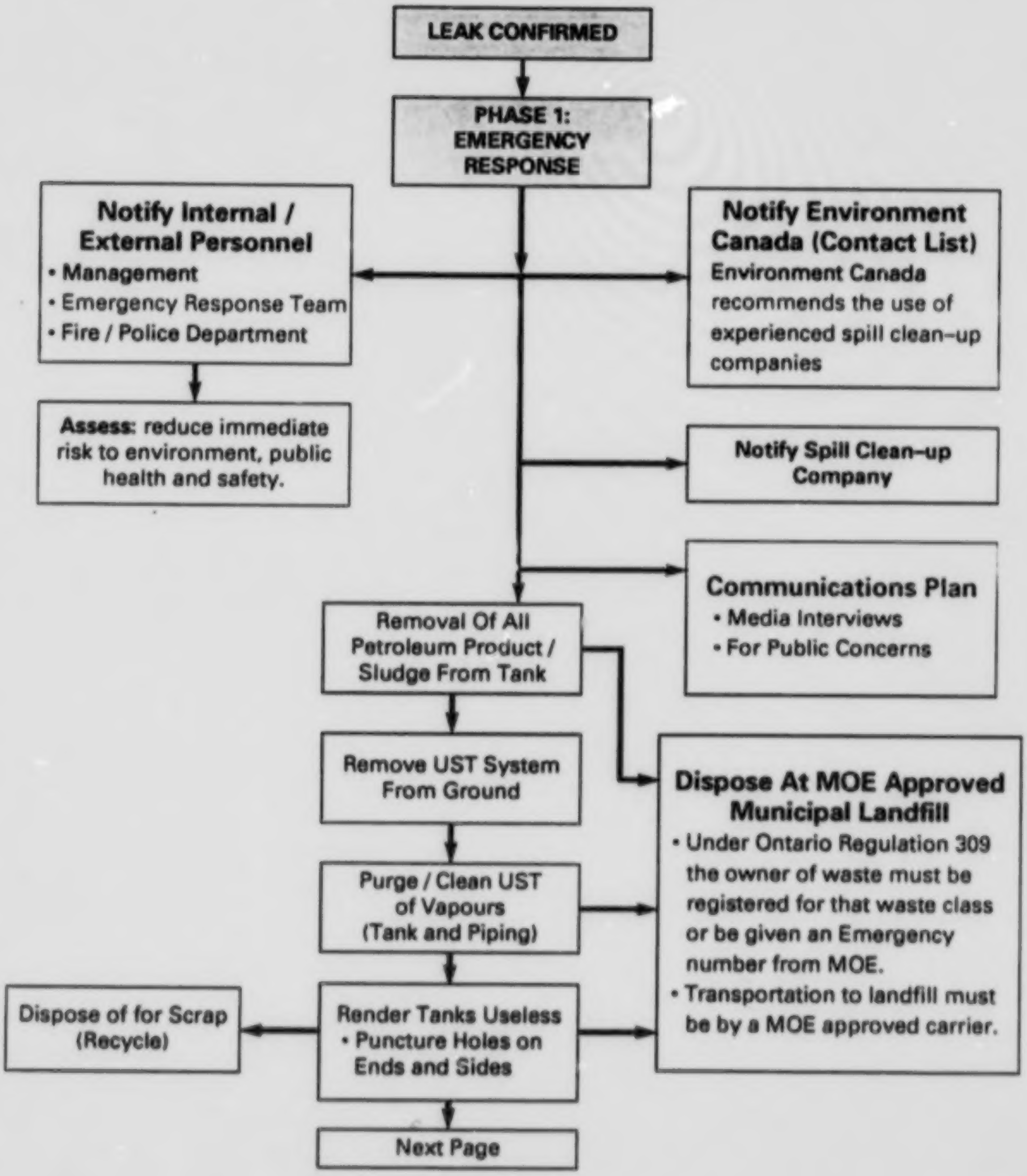
Procedures for Handling Leaking Underground Storage Tanks at Federal Facilities

Flowcharts

- Part 6.3 – Site Investigation and Assessment
    - Part 6.3.1 – Emergency Response Phase
    - Part 6.3.2 – Investigative and Remedial Planning Phase
- Part 6.5(a) – Soil Clean–up Criteria
- Part 6.5(b) – Water Clean–up Criteria
- Part 6.6 – Leachate Testing Requirement

Part 6.3.1 – Site Investigation and Assessment

Procedures for Handling Leaking Underground Storage Tanks at Federal Facilities.



LEAK CONFIRMED

PHASE 1: EMERGENCY RESPONSE

Notify Internal / External Personnel
- Management
- Emergency Response Team
- Fire / Police Department

Assess: reduce immediate risk to environment, public health and safety.

Notify Environment Canada (Contact List)
Environment Canada recommends the use of experienced spill clean-up companies

Notify Spill Clean-up Company

Communications Plan
- Media Interviews
- For Public Concerns

Removal Of All Petroleum Product / Sludge From Tank

Remove UST System From Ground

Purge / Clean UST of Vapours (Tank and Piping)

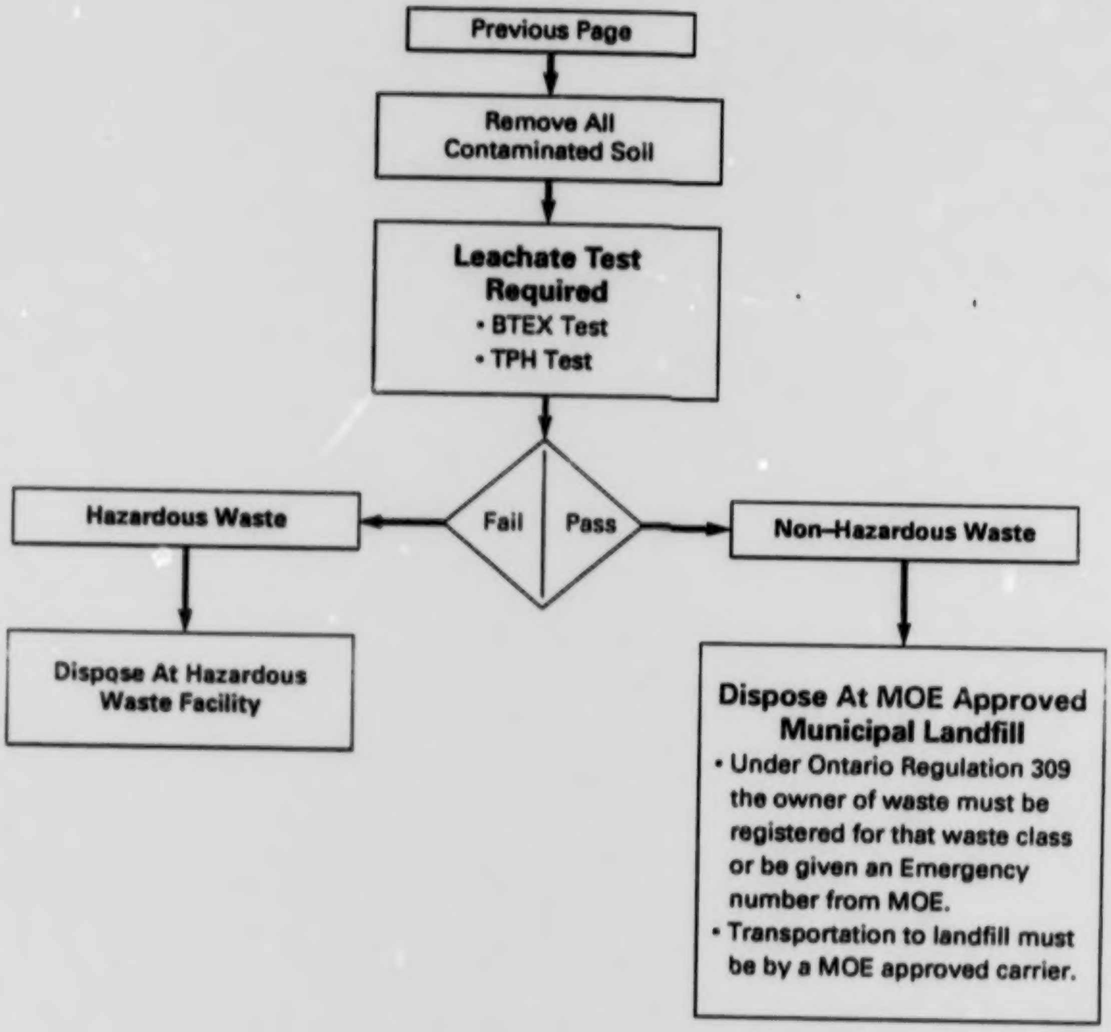
Render Tanks Useless
- Puncture Holes on Ends and Sides

Dispose of for Scrap (Recycle)

Dispose At MOE Approved Municipal Landfill
- Under Ontario Regulation 309 the owner of waste must be registered for that waste class or be given an Emergency number from MOE.
- Transportation to landfill must be by a MOE approved carrier.

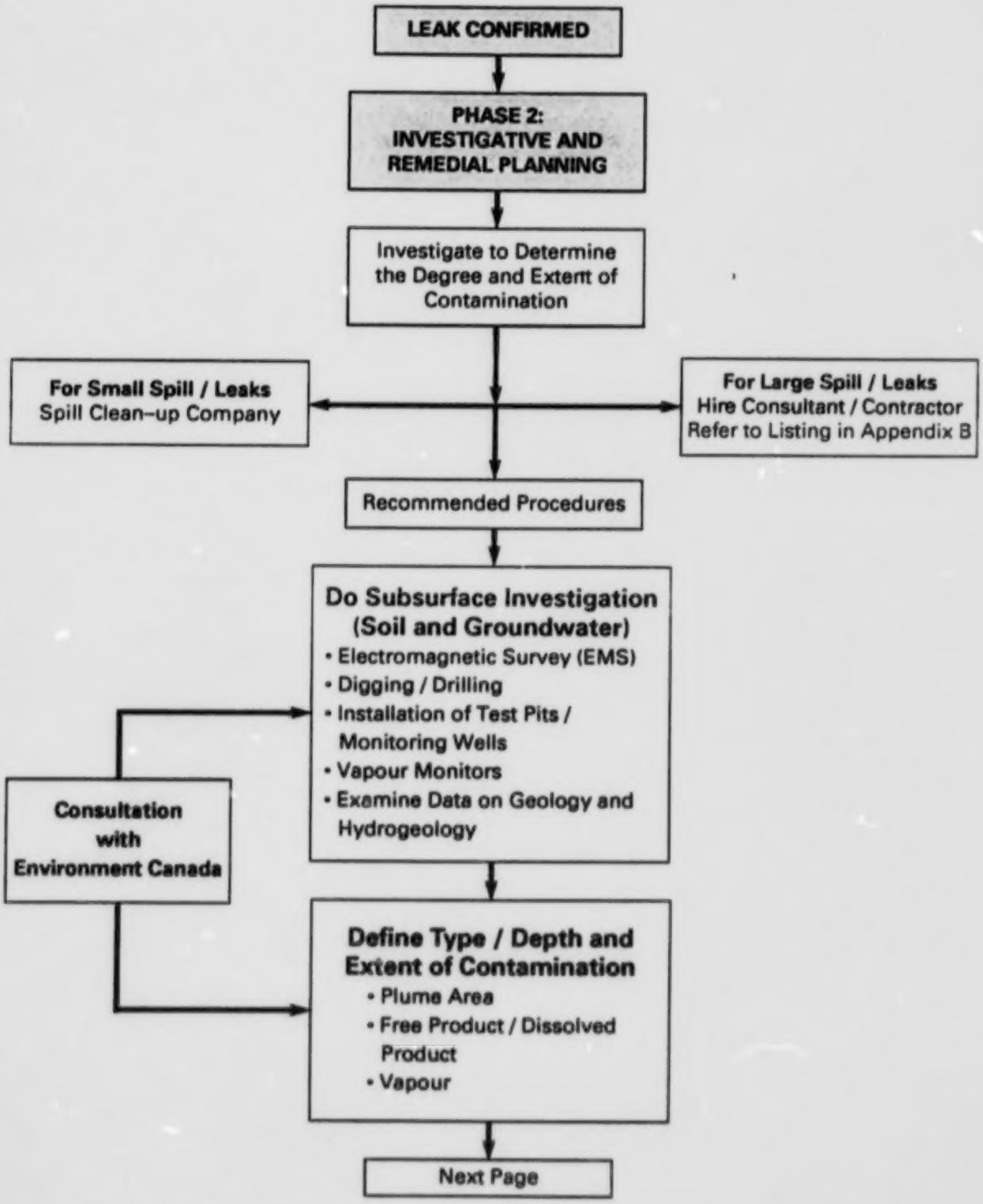
Next Page

Part 6.3.1 – Site Investigation and Assessment (Continued)

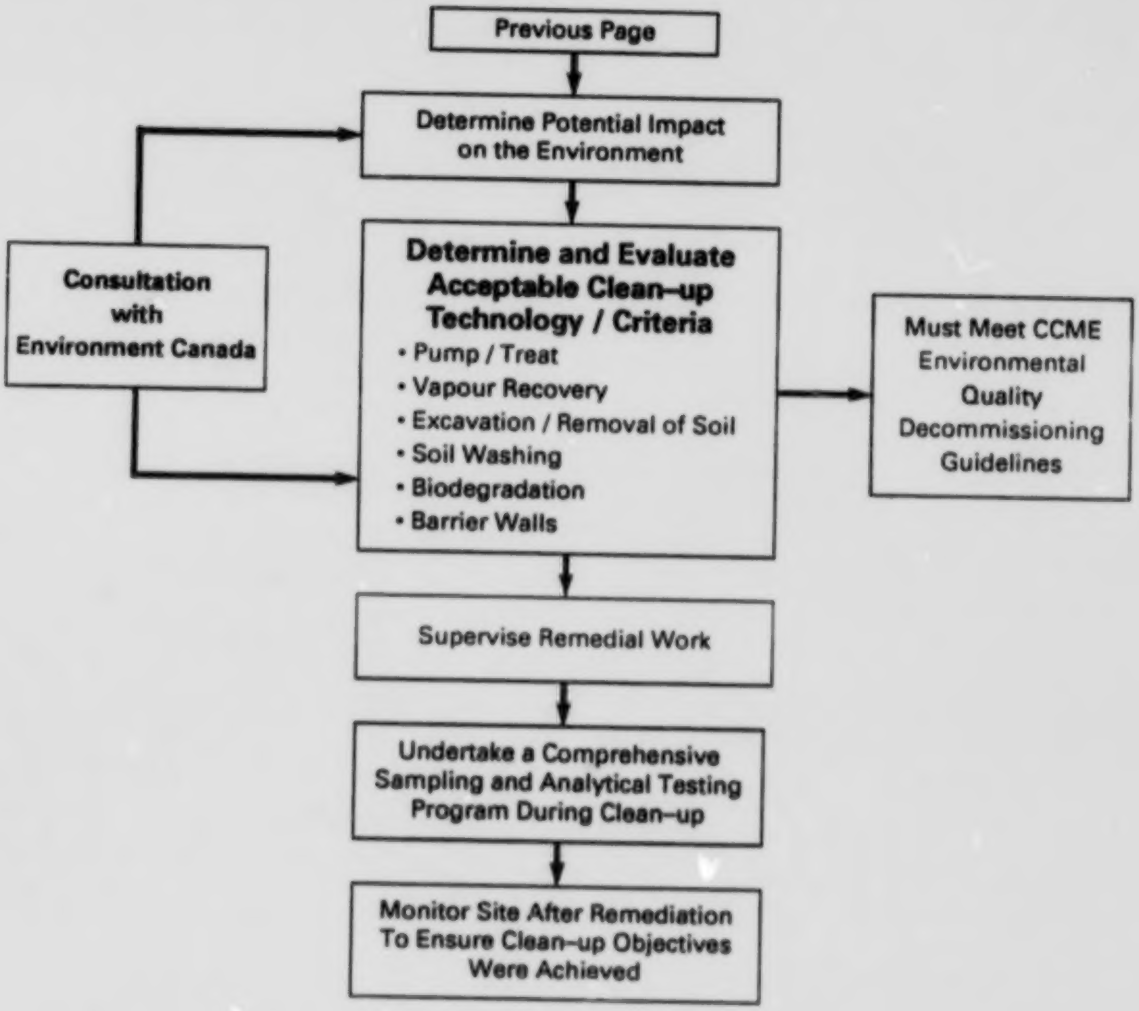

Previous Page
Remove All Contaminated Soil
Leachate Test Required
• BTEX Test
• TPH Test
Fail
Pass
Hazardous Waste
Non–Hazardous Waste
Dispose At Hazardous Waste Facility
Dispose At MOE Approved Municipal Landfill

- Under Ontario Regulation 309 the owner of waste must be registered for that waste class or be given an Emergency number from MOE.
- Transportation to landfill must be by a MOE approved carrier.

Part 6.3.2 – Site Investigation and Assessment


LEAK CONFIRMED
PHASE 2: INVESTIGATIVE AND REMEDIAL PLANNING
Investigate to Determine the Degree and Extent of Contamination
For Small Spill / Leaks
Spill Clean–up Company
For Large Spill / Leaks
Hire Consultant / Contractor
Refer to Listing in Appendix B
Recommended Procedures
Do Subsurface Investigation (Soil and Groundwater)
• Electromagnetic Survey (EMS)
• Digging / Drilling
• Installation of Test Pits / Monitoring Wells
• Vapour Monitors
• Examine Data on Geology and Hydrogeology
Consultation with Environment Canada
Define Type / Depth and Extent of Contamination
• Plume Area
• Free Product / Dissolved Product
• Vapour
Next Page

Part 6.3.2 – Site Investigation and Assessment (Continued)



Previous Page

Determine Potential Impact on the Environment

Consultation with Environment Canada

Determine and Evaluate Acceptable Clean–up Technology / Criteria

- Pump / Treat
- Vapour Recovery
- Excavation / Removal of Soil
- Soil Washing
- Biodegradation
- Barrier Walls

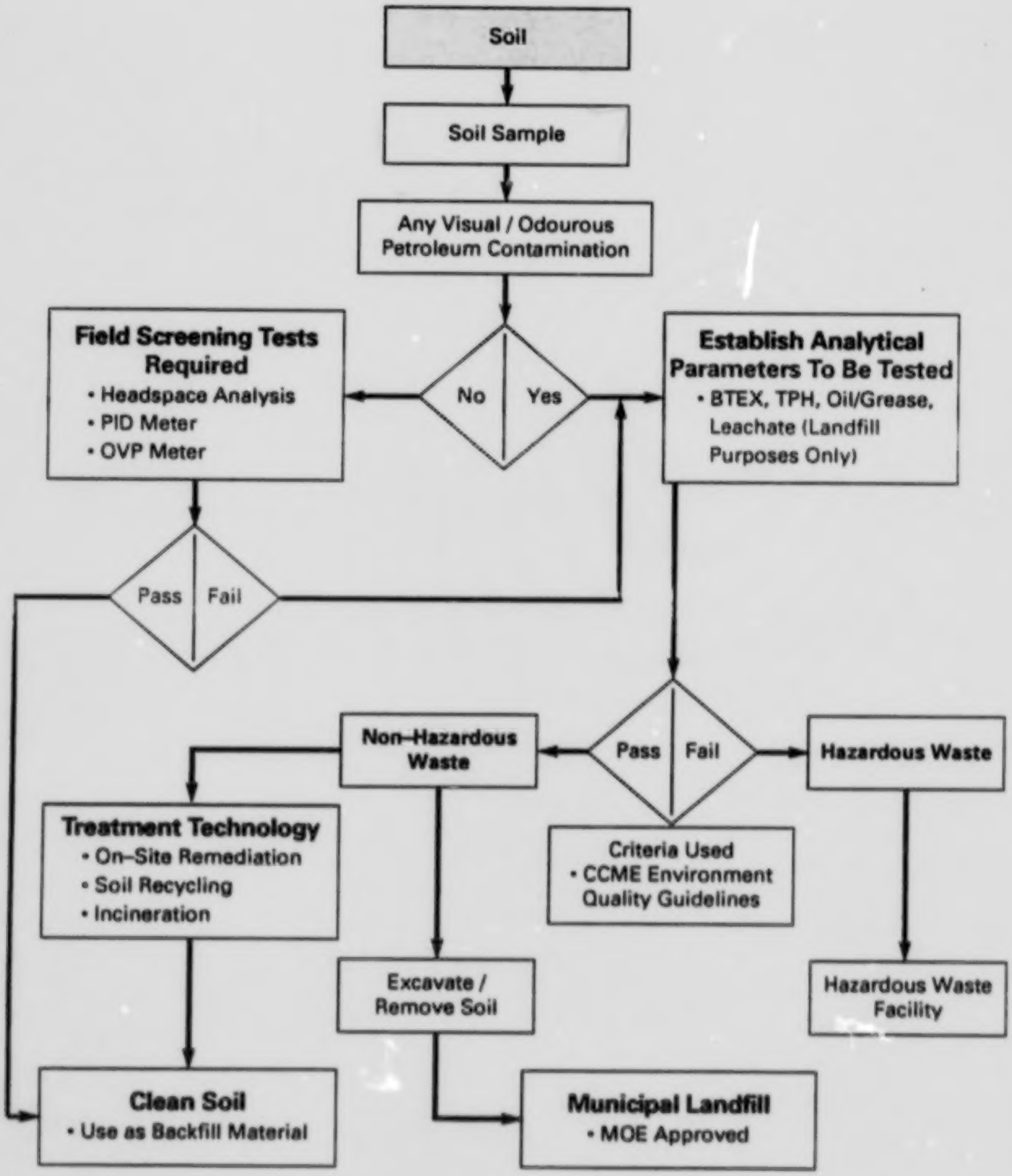
Must Meet CCME Environmental Quality Decommissioning Guidelines

Supervise Remedial Work

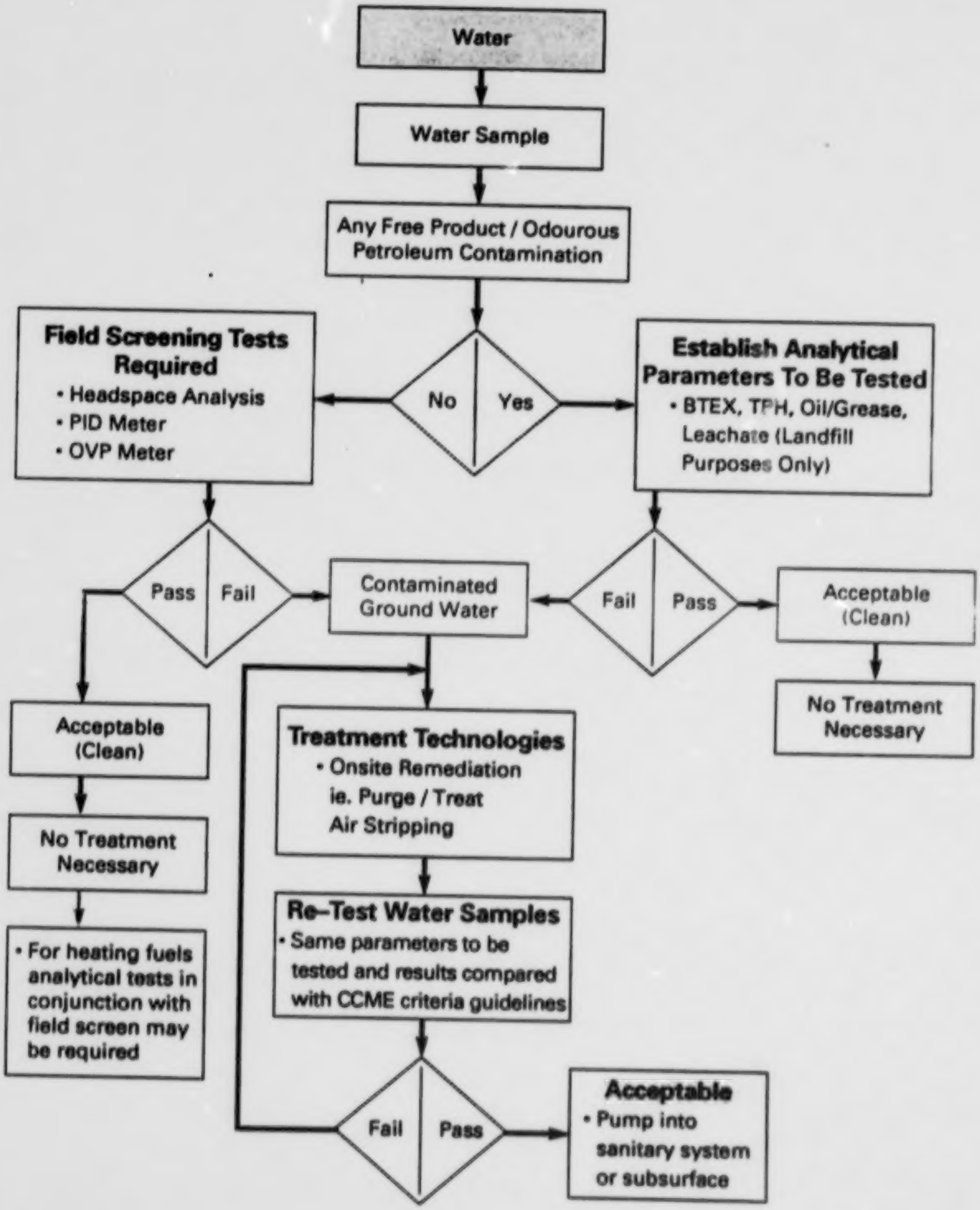
Undertake a Comprehensive Sampling and Analytical Testing Program During Clean–up

Monitor Site After Remediation To Ensure Clean–up Objectives Were Achieved

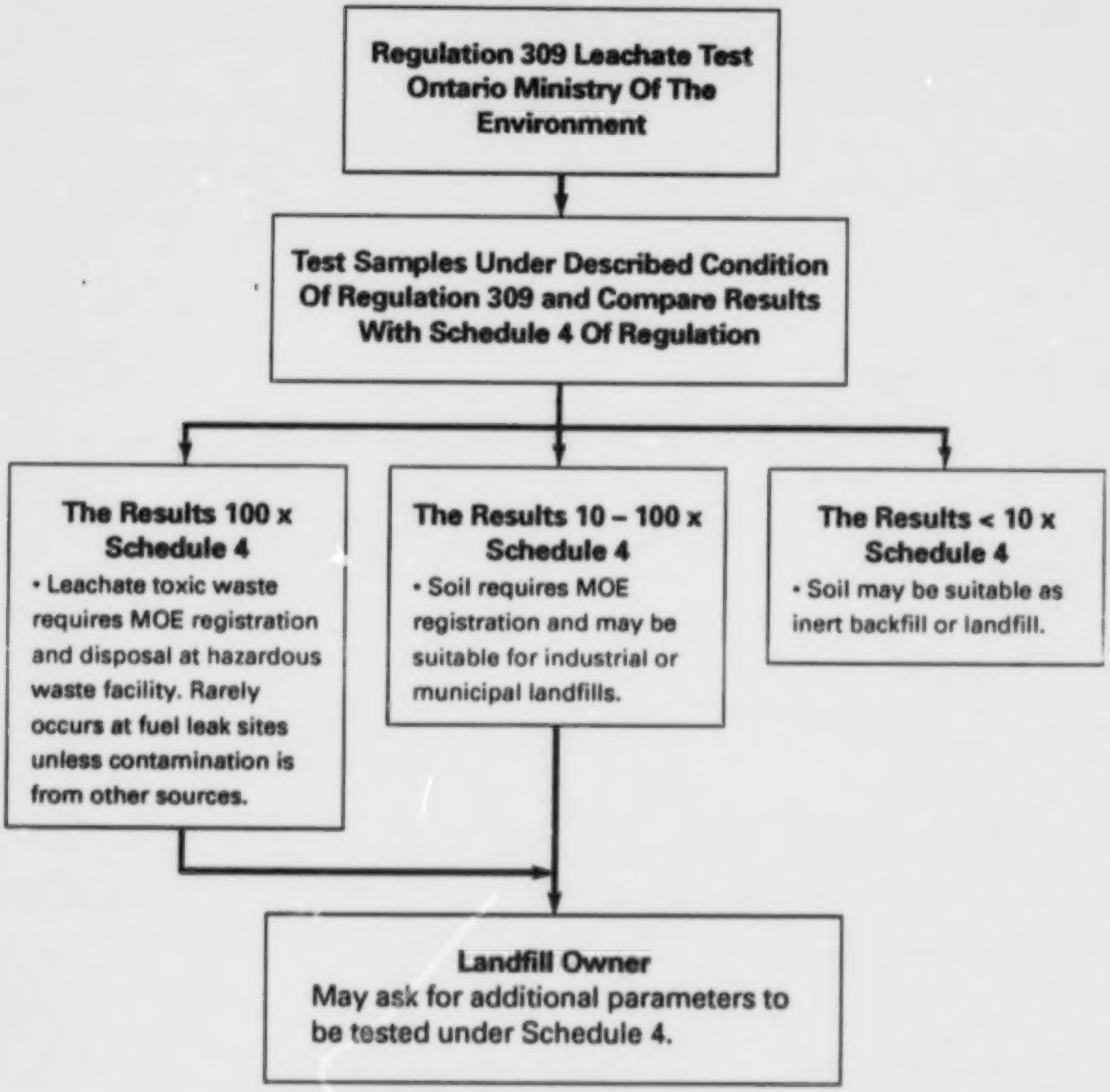
Part 6.5(a) – Soil Clean–up Criteria Procedures Flowchart


Soil
Soil Sample
Any Visual / Odourous Petroleum Contamination
No
Yes
Field Screening Tests Required
• Headspace Analysis
• PID Meter
• OVP Meter
Establish Analytical Parameters To Be Tested
• BTEX, TPH, Oil/Grease, Leachate (Landfill Purposes Only)
Pass
Fail
Non–Hazardous Waste
Pass
Fail
Hazardous Waste
Treatment Technology
• On–Site Remediation
• Soil Recycling
• Incineration
Criteria Used
• CCME Environment Quality Guidelines
Excavate / Remove Soil
Hazardous Waste Facility
Clean Soil
• Use as Backfill Material
Municipal Landfill
• MOE Approved

Part 6.5(b) – Water Clean–up Criteria Procedures Flowchart


Water
Water Sample
Any Free Product / Odourous Petroleum Contamination
No
Yes
Field Screening Tests Required
• Headspace Analysis
• PID Meter
• OVP Meter
Establish Analytical Parameters To Be Tested
• BTEX, TPH, Oil/Grease, Leachate (Landfill Purposes Only)
Pass
Fail
Contaminated Ground Water
Fail
Pass
Acceptable (Clean)
No Treatment Necessary
Acceptable (Clean)
Treatment Technologies
• Onsite Remediation ie. Purge / Treat Air Stripping
No Treatment Necessary
Re–Test Water Samples
• Same parameters to be tested and results compared with CCME criteria guidelines
• For heating fuels analytical tests in conjunction with field screen may be required
Fail
Pass
Acceptable
• Pump into sanitary system or subsurface

Part 6.6 – Leachate Testing Requirement (For Landfill Purposes)



Regulation 309 Leachate Test Ontario Ministry Of The Environment

Test Samples Under Described Condition Of Regulation 309 and Compare Results With Schedule 4 Of Regulation

The Results 100 x Schedule 4

- Leachate toxic waste requires MOE registration and disposal at hazardous waste facility. Rarely occurs at fuel leak sites unless contamination is from other sources.

The Results 10 – 100 x Schedule 4

- Soil requires MOE registration and may be suitable for industrial or municipal landfills.

The Results < 10 x Schedule 4

- Soil may be suitable as inert backfill or landfill.

Landfill Owner

May ask for additional parameters to be tested under Schedule 4.

LEAKING UNDERGROUND STORAGE TANKS: SITE REMEDIATION

Jim Snider, Consultant, Jacques, Whitford Ltd.

LEAKING UNDERGROUND STORAGE TANKS

SITE REMEDIATION

(NOTE: OUTLINE ONLY)

by

Scott D. Collins, P.Eng

&

James D. Snider, P.Eng
Vice President, Environmental Remediation

Jacques, Whitford Environment Ltd.

ABSTRACT

There are various technologies available for remediating sites which have been contaminated from releases of petroleum hydrocarbons from underground storage tanks. Prior to implementing any of these technologies, it is essential that the site is well characterized geologically and hydrogeologically and the type and characteristics of the petroleum hydrocarbon are understood. The extent of the site remediation will be governed by predetermined provincial or federal clean-up guidelines/criteria. Soil remediation may consist of an in-situ technology (i.e. soil venting) or an ex-situ method (i.e. conventional excavation and disposal). Groundwater remediation will generally consist initially of containment followed by conventional Pump and Treat methods or an alternative in-situ method (i.e. air sparging, bioremediation). The remedial solution will be based on its effectiveness, cost, reliability, ease of operations and limitations.

OUTLINE

INTRODUCTION

SITE CHARACTERIZATION

CHARACTERISTICS OF PETROLEUM HYDROCARBONS

CLEAN-UP (REMEDIATION) GUIDELINES/CRITERIA

SOIL REMEDIATION

GROUNDWATER REMEDIATION

CONCLUSIONS

INTRODUCTION

- Problem Identification
  - Short term emergency measures
  - Long term corrective action
- Release of Petroleum Hydrocarbon
  - Leak
  - Spill
- Significance

WHICH REMEDIAL TECHNOLOGY IS BEST SUITED

- Effectiveness
- Cost
- Reliability
- Ease of Operation
- Limitations

SITE CHARACTERIZATION

- Hydrogeological Site Assessment
  - Physiographic setting
  - Climate
  - Surface hydrology
  - Surficial geology
  - Subsurface hydrogeology
  - Contaminant delineation (vapours, soil residue, free-phase and solubles)
  - Surface water and groundwater usage
- Soil Properties
- Groundwater Conditions

SOIL PROPERTIES

- Soil Type
- Soil Permeability
- Density
- Partitioning
- Porosity (Total, Effective)
- Moisture Content
- Organic Carbon Content
- Soil Contamination
  - Depth and lateral extent
  - Concentrations in soil
  - Distribution and concentration of subsurface vapours
  - Presence of free product

GROUNDWATER CONDITIONS

- Depth to Water Table
- Direction of Groundwater Flow
- Horizontal and Vertical Gradients
- Groundwater Velocity
- Chemistry (organic, inorganic)
- Natural Temperature
- Redox State
- Groundwater Contamination
    - Presence of free product
    - Concentrations of dissolved constituents

CHARACTERISTICS OF PETROLEUM HYDROCARBONS

- Types of Petroleum
  - Gasoline
  - Middle distillates (i.e. diesel fuel, kerosene, jet fuels, etc.)
  - Heavier fuel oils and lubricating oils
  - Waste oil
  - Asphalt and tars

- Physical Properties of Petroleum
  - Density (LNAPL, DNAPL)
  - Viscosity

- Characteristics of Petroleum Hydrocarbon Phases
  - Vapours
  - Adsorbed
  - Free product
  - Dissolved

- Factors Affecting Transport
  - Solubility
  - Aquifer properties
  - Drainage boundaries
  - Pumping wells

CLEAN-UP (REMEDIATION) GUIDELINES/CRITERIA

- Provincial
  - Soil
    - Guidelines for the Decommissioning and Clean-up of Sites in Ontario
    - Aesthetic criteria
    - Background levels
    - Other provincial guidelines (i.e. Quebec and Alberta)
  - Groundwater
    - Ontario Drinking Water Objectives (reference only)
    - Background levels
    - Other provincial guidelines (i.e. Quebec and Alberta)
- Canadian
  - Soil
    - Canadian Interim Environmental Quality Criteria for Contaminated Sites
    - Background levels
  - Groundwater
    - Guidelines For Canadian Drinking Water Quality (reference only)
    - Canadian Interim Environmental Quality Criteria for Contaminated Sites
    - Background levels

SOIL REMEDIATION

IN-SITU:

SOIL VENTING

SOIL FLUSHING

BIOREMEDIATION (SOIL AND GROUNDWATER)

EX-SITU

EXCAVATION AND DISPOSAL

INCINERATION/THERMAL TREATMENT

SOIL WASHING

LANDFARMING

SOIL VENTING

- Removal of Hydrocarbon Vapours from Unsaturated Soil
- Forced Venting (VES) vs Passive Venting
- Applications
    - Unsaturated zone
    - Relatively volatile contaminants
    - Vapour pressure > 0.001 ATM at ambient temperature
    - Soil permeable to air flow
- Components (VES)
    - Subsurface vents
    - Blower fan
    - Vapour treatment system
- Design Considerations (VES)
    - Vent spacing
    - Vent depth/interval
    - Blower sizing
- Limitations
    - Low volatile compounds (i.e. crude oil & jet fuel)
    - Low permeable soils
    - High water table
- Enhanced Soil Venting (Air Sparging)
    - Inject air beneath water table while operating VES
    - Extract vapours from cone of drawdown of recovery wells

SOIL FLUSHING

- Removal of contaminants from soil by water, water plus an additive or by a solvent
- Applications
  - Soil permeable to groundwater flow (i.e. sandy soils)
  - Low water soluble contaminants (i.e. petroleum hydrocarbons)
  - Require surfactant solutions or solvents
- Components
  - Recovery wells
  - Groundwater treatment system
  - Injection wells or galleries (trenches)
- Limitations
  - Difficult to achieve uniform cleaning
  - Activated carbon not effective to treat groundwater containing surfactants or solvents

BIOREMEDIATION (SOIL AND GROUNDWATER)

- Process by which organic contaminants are destroyed by the action of soil bacteria
- Bio-Augmentation vs Bio-Stimulation
- Bio-Feasibility Testing
- Knowledge of background soil and groundwater conditions is essential
- Applications
    - Soil and groundwater remediation
    - Soluble hydrocarbons plumes
    - Organic solvents
    - Soils permeable to water flow
- Components
    - Injection wells or galleries
    - Recovery wells
    - Mixing tank (optional)
- Limitations
    - PAH's (some anaerobic techniques available)
    - Salt and/or metals may inhabit microbial activity
    - Low permeable soils

EXCAVATION AND DISPOSAL

- Contaminated soil is excavated and sent to an approved disposal facility
- Applications
    - Shallow contaminants
    - Small volumes
    - Quick solution
- Limitations
    - Depth of contamination
    - Contamination beneath buildings or other structures
    - Congested or heavily travelled areas
    - Potential to exposing workers and general public to the contaminants
    - Availability of approved disposal sites
- Costs
    - Site preparation
    - Excavation
    - Material handling
    - Backfill material
    - Grading
    - Handling
    - Disposal
- Potential for Re-Contamination

INCINERATION/THERMAL TREATMENT

INCINERATION

- Treatment of soils contaminated with a wide variety of hazardous organic wastes
- High Temperature Combustion
- Incineration Processes
  - Rotary kiln
  - Fluidized bed
  - Multiple hearth
  - Liquid injection
- Applications
  - Most organic contaminated wastes
- Limitations
  - Soils with significant amounts of alkali salts
  - Metals and salts
  - Soil must be excavated
  - Treatment of off-gases

THERMAL TREATMENT

- Treatment of soils contaminated with volatile/semi-volatile organics
- Volatilization of Contaminants
- Applications
  - Soils contaminated with volatile and semi-volatile organics (i.e. gasoline, chlorinated solvents; etc.)
- Limitations
  - High levels of organic contaminants
  - Compounds which do not volatilize at temperatures of 200-500·C
  - Metal contaminants
  - Soil must be excavated
  - Treatment of off-gases

SOIL WASHING

- Contaminants removed from soils by mixing with a solvent into which the contaminants preferentially partition
- Commonly used solvents for petroleum hydrocarbons
  - Water with a surfactant
  - Organic solvents
- Applications
  - Soils contaminated with large amounts of organics
  - Soils contaminated with relatively non-volatile organics
  - Pilot testing is required
- Limitations
  - Soil must be excavated
  - Contaminants transferred to water phase which must be treated by other technologies

LANDFARMING

- **Tilling soils to enhance biodegradation and volatilization of hydrocarbons**
- **Applications**
    - **Various types of petroleum wastes (i.e. oily sludges, tank bottoms, etc.)**
    - Gasoline
    - Unsaturated zone
- **Combination of landfarming and bioremediation**
- Combination of landfarming and ex-situ soil venting
- Design (maximize rate of biodegradation & volatization)
    - Control soil aeration
    - Nutrient addition (fertilizers)
    - pH
    - Moisture control
- Limitations
    - **Seasonal (temperature)**
    - **High water table**
    - PAH's (degrade slowly in soil)
    - **Accumulation of heavy metals**
    - **Requires large open area**
    - **Control of vapour emissions**

GROUNDWATER REMEDIATION

PUMP & TREAT/CONTAINMENT

FREE PRODUCT RECOVERY/SEPARATION

AIR STRIPPING

CARBON ADSORPTION

AIR SPARGING

ENHANCED OXIDATION

FREE PRODUCT RECOVERY/SEPARATION

- Pumping Wells vs Trenches
- Trench Method
  - Intercept flow of floating hydrocarbon
  - Limitations
    - Shallow water table
    - Pumping and skimming must be continuous
- Pumping Well Method
  - Skimmer pump
  - Single pump
  - Dual pump systems
- Oil/Water Separators
- Disposal of Recovered Petroleum Hydrocarbons

AIR STRIPPING

- Relatively simple technique for removal of volatile organics compounds from groundwater
- Several Methods of Air Stripping
    - Diffused air
    - Tray aeration
    - Spray aeration
    - Packed towers
- Removal Efficiencies
- Design and performance affected by a variety of factors
    - Temperature of the air and water
    - Air/water ratio
    - Presence of inorganic substances (Fe, Mn)
    - Characteristics of the hydrocarbon compound to be stripped
- Limitations
    - Heavier hydrocarbons (i.e. fuel oil) which can not be removed effectively by air stripping
    - High iron and manganese concentrations
    - High noise levels from stripper
    - Varying water chemistry affects stripping efficiency

CARBON ADSORPTION

- Capable of removing low concentrations of dissolved organic compounds from groundwater
- Granular Activated Carbon (GAC)
- Effectiveness
- Design Factors
  - Influent concentrations
  - Characteristics of activated carbon
  - Characteristics of hydrocarbons
  - General groundwater chemistry
  - Flow rate
- Pressurized Carbon Units
- Combined Air Stripper and Carbon Adsorption
- Limitations
  - Flow rates
  - Biofouling
  - Regeneration
  - Size

AIR SPARGING

- Air is injected directly into the saturated zone
- Effective remedial process for volatile organics (i.e. BTEX)
- Application
  - Highly permeable saturated zones (i.e. 10^{-3} cm/sec)
  - Relatively insoluble volatile organics (i.e, BTEX)
  - Unconfined aquifers
- Concept
  - Compressed air is injected through a well screen located beneath the water table
  - Air is subsequently captured by a VES in the unsaturated zone
- Limitations
  - Low permeable aquifers
  - Lateral movement of air

ENHANCED OXIDATION

- Use of ultraviolet light in combination with oxidants (i.e. ozone and hydrogen peroxide)
- Applications
  - Wide variety of organic compounds
  - Recommended if other organics are present in the groundwater that cannot be treated by conventional methods
- Process Description
  - Water pumped from recovery wells passes through a series of high power ultraviolet lights
- Limitations
  - Costs (capital and operational)

CONCLUSIONS

- Release of petroleum hydrocarbons is a potential threat to the environment
- Knowledge of site (hydrogeological setting) and hydrocarbon (i.e. type, concentrations, etc.) is essential prior to preparing remediation plan
- Establishing the appropriate clean-up objectives is essential
- Many in-situ and ex-situ processes are available for soil and groundwater treatment of petroleum hydrocarbons
- Monitoring effectiveness of soil and groundwater clean-up is essential

REFERENCES

Alberta Must, Subsurface Remediation Guidelines For Underground Storage Tanks, December 1989.

American Petroleum Institute, A Guide to the Assessment and Remediation of Underground Petroleum Release, API Publication 1628, August 1989.

Remediation Technologies Inc. and Harress Pickel Consult, In-Situ Aeration of Groundwater, a Technology Overview, A Conference on Prevention and Treatment of Soil and Groundwater Contamination in the Petroleum Refining and Distribution Industry, Montreal, Quebec, October 1990.

Shell Development, Soil Remediation Workshop, Fifth Annual Conference Hydrocarbon Contaminated Soils, Amherst, Massachusetts, September 1990.

U.S. Environmental Protection Agency, Clean-up of Releases from Petroleum USTs: Selected Technologies, EPA/530/UST-88/001, April 1988.

SITE REMEDIATION CASE STUDY: LEAKING UNDERGROUND STORAGE TANKS AT AGRICULTURE CANADA ANIMAL DISEASE RESEARCH INSTITUTE

Carlos Da Silva, Consultant, John D. Patterson and Associates Ltd.

SITE REMEDIATION CASE STUDY:

LEAKING UNDERGROUND STORAGE TANKS
at Agriculture Canada Animal Disease Research Institute
Nepean, Ontario

Carlos P. Da Silva, P.Eng.
Andrew J. Tovell, P.Eng.

Senior Engineer, Environmental Department and
Senior Engineer, Head of Geotechnical Department (respectively)
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ABSTRACT

This paper presents the results of an environmental investigation and summarizes the remediation operations carried out at the site of leaking underground storage tanks at the Agriculture Canada Animal Disease Research Institute in Nepean, Ontario. The investigation was limited to the underground fuel storage tanks including an underground blending tank located adjacent to the existing heating plant. The blending tank which forms part of the biowaste system, was found to be leaking and ultimately complicated the remediation work. At the time of submitting this paper, the remediation operations were underway and are anticipated to be completed by the end of April, 1991. To compliment the field investigation and delineate possible contaminated areas, an electromagnetic survey was carried out by Geoterrex Limited of Ottawa. Fuel-related contamination was considered to be limited to the soil and water in the immediate excavation of the storage tanks and blending tank. On the other hand, phenolic compound contamination was considered to be limited to the groundwater. However, possible spreading of fuel and phenolic compounds in the backfill and bedding of the vast network of underground piping is being investigated as part of the remediation operations.

1.0 INTRODUCTION

John D. Paterson and Associates Limited was commissioned to undertake an environmental investigation for the decommissioning and cleanup of a fuel spill in the vicinity of two (2) No. 2 Fuel storage tanks adjacent to the heating plant at the Food Production and Inspection Branch, Animal Diseases Research Institute in the City of Nepean, Ontario. The purpose of this case study is to present our summarized findings and to provide an assessment of the environmental conditions at this site including remediation operations.

2.0 BACKGROUND

The site of the existing underground No. 2 Fuel storage tanks under investigation is located east of the south east corner of the existing heating plant building. The subject site, under the initial field investigation program, is bordered by access roadways to the east and south, the heating plant to the west and by an existing access ramp to the north. An existing underground blending tank and associated piping, forming part of a complex biowaste system, is located immediately east of the subject fuel storage tanks. (Refer to **Figure 1 - Test Hole Location Plan**)

It was understood the underground tanks were exclusively used for No. 2 Fuel storage. According to the present Agriculture Canada and Public Works Canada personnel at this facility, only minor spills have ever occurred in the vicinity of the tank inlet pipes.

At the time of the field work for the initial investigation, operations for the removal of the existing fuel tanks were being carried out. It is understood that leaking was initially discovered during excavation operations to expose and inspect the tanks with the purpose of providing cathodic protection.

Both underground tanks are approximately 18 years old with each tank having a volume of approximately 90 m^3 (90,000 litres). The existing tanks were founded on concrete saddles supported by a concrete slab which extend to a depth of approximately 1.2 metres below the invert of the tank at an elevation of approximately 92.35 metres. Prior to the completion of the field work, the existing tanks were both emptied, removed and stored temporarily on site. Due to the age of the tanks and their designation as a Class A installation, it is understood that the tanks will not be reused and, therefore, will require a permanent disposal method. An agency of the Federal Government addressed the disposal of the tanks.

The underground blending tank was incorporated into this investigation due to its proximity to the underground fuel storage tanks. It was understood that the blending tank is the final link of the biowaste system for the disposal of various chemical agents and aqueous phenolic germicidal detergents from the laboratories of the Animal Disease Research Institute. The blending tank was installed in 1990 for the purpose of cooling the biowaste effluent by mixing it with the normal, cooler, sanitary sewer effluent prior to discharging it into the sanitary sewer when temperatures are below 60°C.

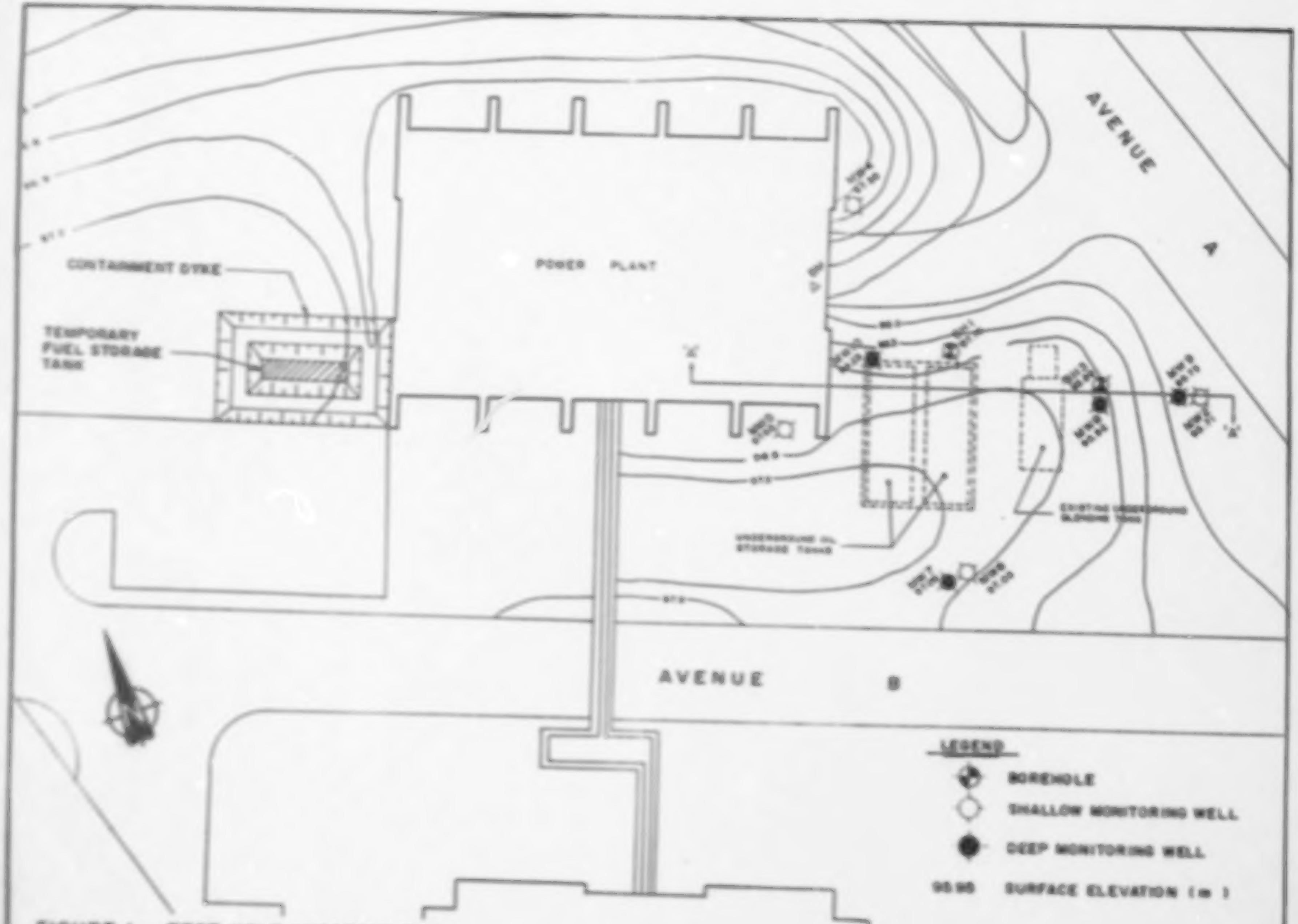

AVENUE A
POWER PLANT
CONTAINMENT DYKE
TEMPORARY FUEL STORAGE TANK
UNDERGROUND OIL STORAGE TANKS
EXISTING UNDERGROUND BLENDING TANK
A
A'
AVENUE B
LEGEND
BOREHOLE
SHALLOW MONITORING WELL
DEEP MONITORING WELL
95.90 SURFACE ELEVATION (m)

FIGURE 1 - TEST HOLE LOCATION PLAN

3.0 FIELD INVESTIGATION

A total of ten (10) boreholes and monitoring wells (BH-1, MW-2, BH-3, and MW-4 to MW-10) were augered to depths ranging from 2.6 to 6.7 metres using track-mounted CME drilling equipment and occasionally truck-mounted CME drilling equipment. The boreholes and monitoring wells were augered at the locations shown on Figure 1, Test Hole Location Plan.

The track and truck mounted CME drills were steam cleaned prior to commencing the drilling program to ensure that the samples taken would not be affected by contamination from outside sources. All equipment in direct contact with the soil was cleaned prior to and after sampling to avoid or minimize the spread of contaminants within the underlying soils and groundwater.

Samples of the soil were recovered using a clean split spoon sampler. Auger and split spoon samples were classified texturally in the field and sealed in proper containers for further perusal and testing in our laboratory. Selected samples were shipped to Bondar-Clegg and Company Limited of Gloucester for "coarse" laboratory chemical testing.

Monitoring Well Construction

Monitoring well piezometers with locking caps were installed at all locations with the exception of Boreholes 1 and 3. These piezometers were constructed to allow groundwater sampling for chemical analyses used to carry out an environmental assessment.

Monitoring wells located within the obviously contaminated soil/fill were terminated within the upper levels of the in-situ soil. The shallow monitoring wells were numbered as MW-2, MW-4, MW-5 and MW-6. They were constructed of 50 mm diameter threaded PVC pipe (using no glue, which can introduce a contaminant bias to the samples). Slotted PVC screen was installed from above the high groundwater level to the bottom of the holes. The purpose of these monitoring wells was to sample the groundwater within the possible perched groundwater table trapped within the existing fill layer.

Monitoring wells that extended into the underlying in situ soil (MW-7 to MW-10) were constructed differently from the shallow wells noted above. To preclude the contamination of the soil and groundwater samples at depth, from the shallower soil and groundwater, a 250 mm diameter permanent steel casing was installed in the upper levels of the borehole within the potentially contaminated soils. The casing was grouted into place to seal off any possible source of contamination related to the presence of the borehole, rather than normal groundwater flow.

The hole was then advanced within the casing, using "clean" equipment, to permit the sampling of the underlying soils and the installation of the monitoring well without any influence from the overlying soil and groundwater. The monitoring wells in the deeper soils were constructed of 50 mm diameter threaded PVC pipe (using no glue, which can introduce a contaminant bias to the samples). Slotted PVC screen, 1.5 or 3.0 metres long, was installed at the bottom of the wells.

All monitoring well installations were packed with inert permeable fill, such as silica sand, around the well screen, and sealed with a bentonite-based grout to ensure isolation of the well and to prevent vertical migration of the groundwater. When monitoring wells were located adjacent to roadways and areas of high vehicle or pedestrian traffic, a protective steel casing, painted red and equipped with a locking cap, was embedded and grouted over the PVC pipe.

Sampling of the groundwater was undertaken with a special sampling pump that does not contact the sample. Clean tubing was utilized for each sample to prevent inter-sample contamination. Groundwater samples recovered from the monitoring well piezometers were stored in the proper containers for the particular chemical parameter(s) being tested, and all samples were shipped to the laboratory immediately after sampling.

4.0 CHEMICAL TESTING

Coarse Testing

As part of the initial testing program, selected soil and groundwater samples were analyzed for coarse phenols and mineral oil and grease.

Elaborate Testing Program

Selected soil and groundwater samples were subjected to further detailed analyses consisting of a Benzene, Toluene, Ethyl Benzene and Xylene (BTEX) test, Total Petroleum Hydrocarbons (TPH) and/or a Priority Pollutant Scan (EPA-625). Schedule 4 Leachate Quality Criteria from MOE's Regulation 309 tests were carried out on selected contaminated soil samples in order to determine whether the materials would satisfy the Ministry of the Environment of Ontario guidelines for disposal of contaminated material within an approved landfill site.

5.0 SUMMARY OF RESULTS OF THE INVESTIGATION

Surface Conditions

The subject site was grass covered and sloping gently downward towards the east. The finished grade surrounding the existing heating plant is sloped to shed surface water away from the foundation wall. Further east, beyond the access roadway is an existing drainage swale which is noticeably at a lower elevation than the subject site. This swale forms part of the upper reaches of the Black Creek basin system which flows to the Rideau River. To our knowledge, no potable water source or surface water drainage system is located within an approximate 100 metres radius of the subject site.

At the time of the field investigation, excavation operations were being performed for the removal of the existing tanks. The tanks were emptied, excavated and removed from their concrete saddles. Contamination of the soil within the founding level of the tanks was evident from an unmistakable No. 2 fuel odour. Contaminated groundwater was encountered within the excavation bottom. A test pit excavated by the excavation contractor using a tractor mounted backhoe was put down east of the existing blending tracks. The groundwater within the test pit exhibited some form of hydrocarbon film on the surface.

Subsurface Profile

The boreholes for the installation of the monitoring wells at this site were located as close to the existing tanks as permitted for a CME truck or track-mounted drill. The purpose behind the location of the boreholes was to enable the sampling of the granular fill materials within the immediate perimeter of the tanks. The granular fill material is considered to be part of the engineered fill used as the foundation mat for the tank base and as backfill for the support of the tank sidewalls. Furthermore, boreholes were also located as close as possible to the foundation walls of the existing heating plant in order to sample the foundation wall backfill materials.

In general, the soil conditions observed at the borehole and monitoring well locations were found to consist of existing fill overlying in situ silty clay which in turn overlies a glacial till deposit followed by inferred bedrock. Reference should be made to the soil profile illustrated in **Figure 2 - Cross-Section A-A**.

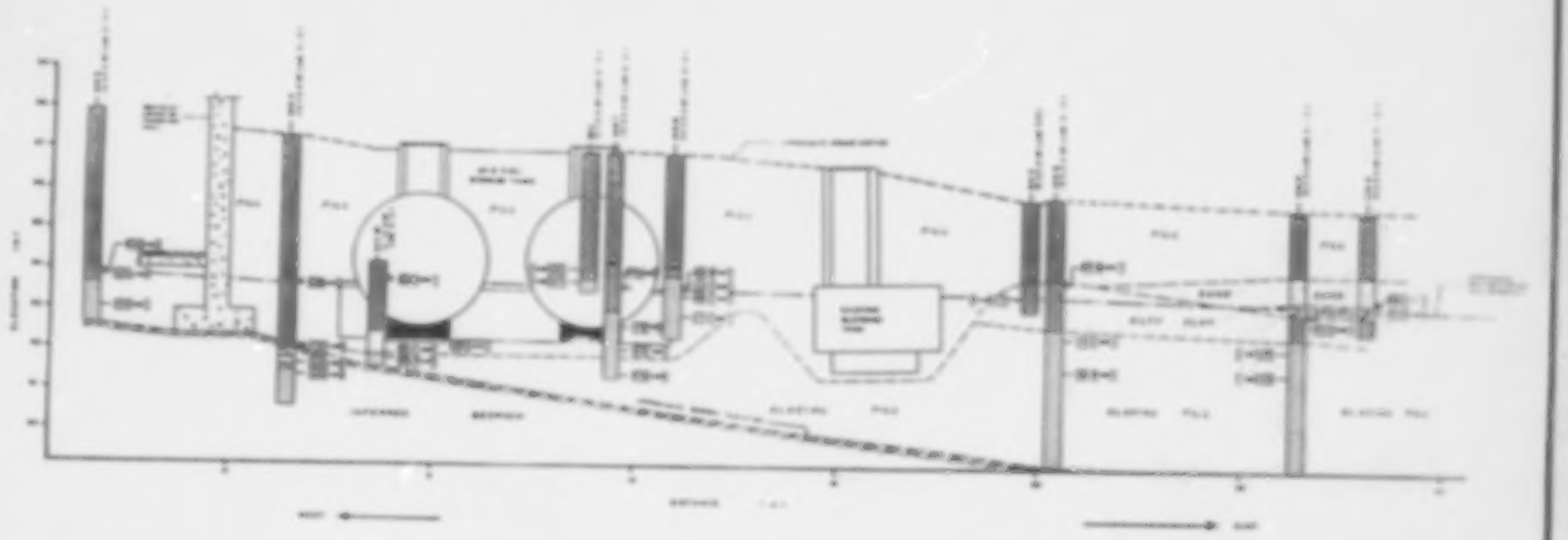


FIGURE 2 - CROSS-SECTION A-A

Groundwater

Groundwater levels recorded in the monitoring wells are shown below. The groundwater flow is in an easterly direction towards the low-lying lands near the swale, at a gradient of approximately 2.0%.

At the time of the field work operations, observed groundwater levels indicated a possible perched groundwater condition due to the relatively impermeable underlying silty clay and dense glacial till layer. The surficial sand fill layer allows penetrating surface water to be trapped within the fill by the underlying clay and till barrier which produces a basin effect. The removal of the tanks may have modified this groundwater condition. The long-term groundwater level is considered to be at the base of the very stiff silty clay and/or upper levels of the glacial till at elevations ranging from 93.1 to 93.9 metres.

Location	Ground Surface Elevation (m)	Groundwater Level		Date
		Depth (m)	Elev. (m)	
MW 2	95.71	2.26	93.45	Dec. 14, 1990
MW 4	97.36	3.66	93.70	Dec. 14, 1990
MW 5	97.95	4.06	93.89	Dec. 14, 1990
MW 6	97.03	3.33	93.70	Dec. 14, 1990
MW 7	97.09	3.35	93.74	Dec. 14, 1990
MW 8	95.95	2.08	93.87	Dec. 14, 1990
MW 9	95.73	2.62	93.11	Dec. 14, 1990
MW 10	94.23	0.46	93.77	Dec. 14, 1990

CONTAMINATION STUDY

References should be made to **Figures 3 and 4** for an illustration of the approximate areas of contamination related to fuel and phenolic compounds.

Soil Quality

Selected soil samples from all boreholes and monitoring wells were analyzed for mineral oil and grease content and phenols as part of the initial coarse testing. The results are summarized as follows:

TABLE 1
ANALYTICAL RESULTS OF SOIL TESTING

BOREHOLE NO.	SAMPLE NO.	DEPTH (m)	ELEVATION (m)	MINERAL OIL & GREASE (PPM)	COARSE PHENOLS (PPM)
BH-1	SS-3	2.9	94.20	31	0.228
BH-1	SS-3A	3.2	93.90	17	0.205
MW-2	SS-6	2.4	93.31	31	0.164
BH-3	SS-8	2.4	93.49	17	0.232
MW-4	SS-13	3.2	92.16	17	0.300
MW-4	SS-14	3.6	91.76	15	0.298
MW-4	SS-14A	3.9	91.46	15	0.269
MW-5	SS-16	4.1	93.85	16	0.200
MW-5	SS-17	4.9	93.05	19	0.002
MW-6	SS-20A	3.2	93.83	17	2.000
MW-6	SS-20B	3.5	93.53	190	1.500
MW-6	SS-21	4.0	93.03	17	1.000
MW-7	SS-24	4.3	92.79	16	1.800
MW-7	SS-25	4.9	92.19	51	1.800
MW-7	SS-26	5.5	91.59	57	0.800
MW-8	SS-27	3.5	92.45	15	1.500
MW-8	SS-28	4.3	91.65	30	0.990
MW-9	SS-32	3.5	92.23	15	1.100
MW-9	SS-33	4.1	91.63	13	1.300
MW-10	SS-22	2.0	92.23	303	0.970
MW-10	SS-23	2.3	91.93	32	1.200
MW-10	SS-23A	2.4	91.83	135	0.670
SOIL FROM SLAB BASE	SS-0	3.0	94.00	902	0.359

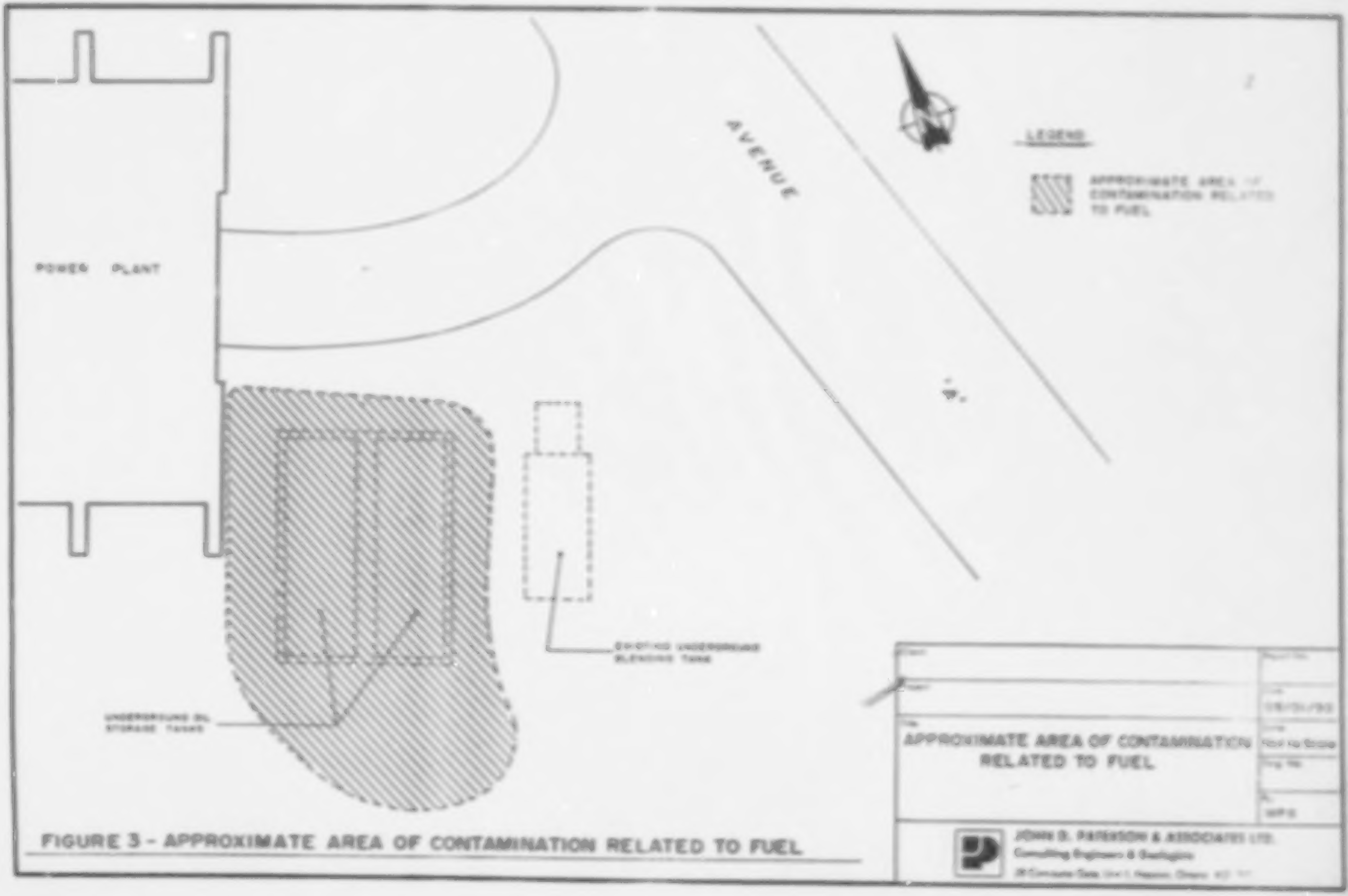

POWER PLANT
AVENUE
LEGEND
APPROXIMATE AREA OF CONTAMINATION RELATED TO FUEL
UNDERGROUND OIL STORAGE TANKS
EXISTING UNDERGROUND BLENDING TANK
APPROXIMATE AREA OF CONTAMINATION RELATED TO FUEL
Not to Scale
JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers & Geologists

FIGURE 3 - APPROXIMATE AREA OF CONTAMINATION RELATED TO FUEL

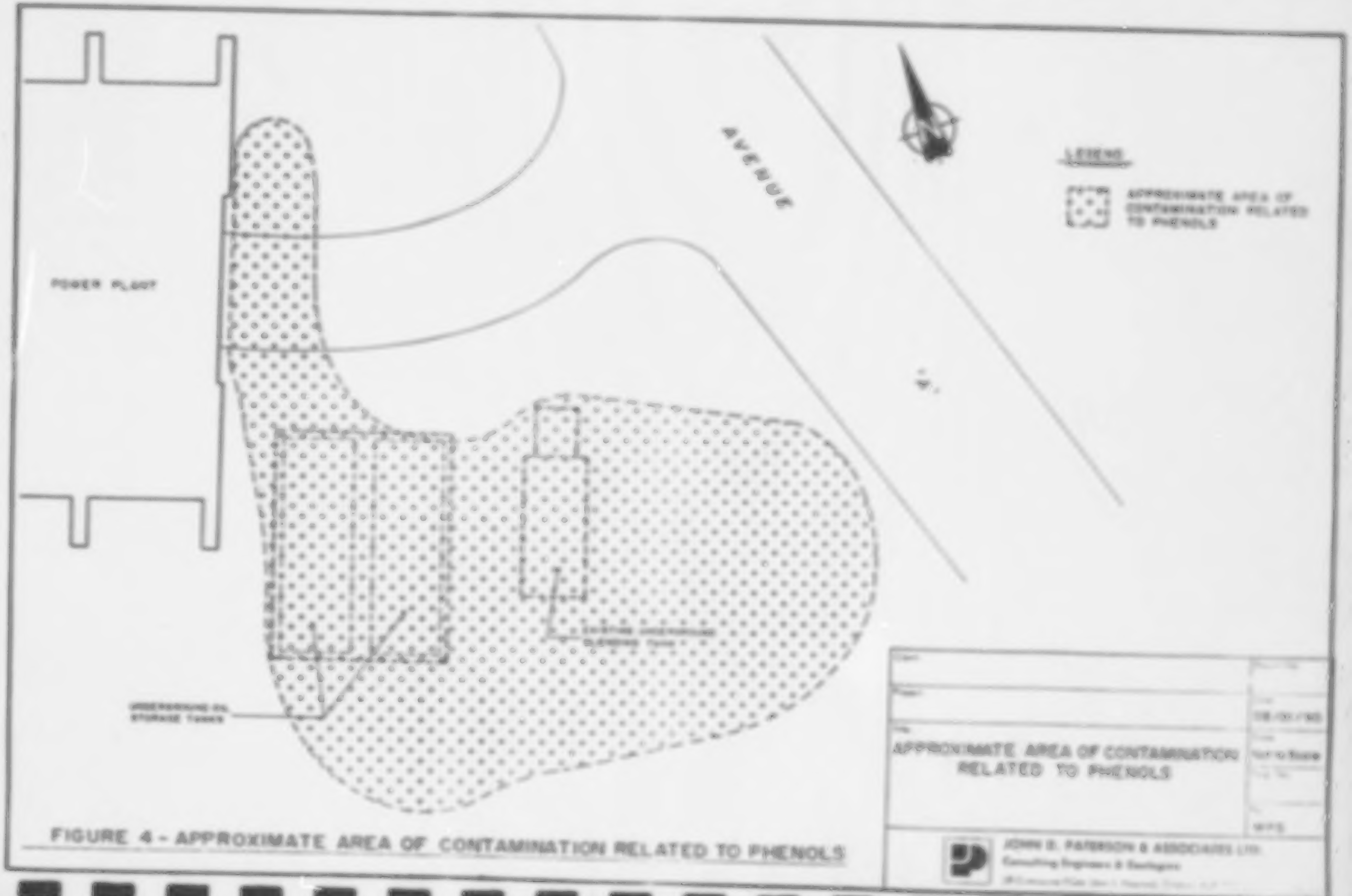

POWER PLANT
AVENUE
LEGEND
APPROXIMATE AREA OF CONTAMINATION RELATED TO PHENOLS
UNDERGROUND OIL STORAGE TANKS
EXISTING UNDERGROUND BLENDING TANK
APPROXIMATE AREA OF CONTAMINATION RELATED TO PHENOLS
Not to Scale
WPS
JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers & Geologists

FIGURE 4 - APPROXIMATE AREA OF CONTAMINATION RELATED TO PHENOLS

In order to ascertain if No.2 Fuel (diesel fuel) is present in the soil and to determine concentration levels, selected soils samples were submitted for Total Petroleum Hydrocarbon (TPH) analysis. A sample of the No.2 Fuel from the actual heating plant was recovered for the purpose of calibrating the TPH scanner. The results are summarized as follows:

TABLE 2
ANALYTICAL RESULTS OF SOIL TESTING

BOREHOLE NO.	SAMPLE NO.	DEPTH (m)	ELEVATION (m)	TOTAL PETROLEUM HYDROCARBON (PPM)
MW-6	SS-20A	3.1	93.93	< 1
MW-6	SS-20B	3.4	93.63	< 1
MW-6	SS-21	4.0	93.03	< 1
MW-7	SS-25	4.8	92.29	< 1
MW-7	SS-26	5.5	91.59	< 1
MW-8	SS-27	3.4	92.55	< 1
MW-8	SS-28	4.2	91.75	< 1
MW-9	SS-32	3.4	92.33	< 1
MW-9	SS-33	4.1	91.63	< 1
MW-10	SS-22	1.7	92.53	950
MW-10	SS-23	2.2	92.03	1
MW-10	SS-23A	2.5	91.73	410
BOTTOM OF TANK EXC.	SS-0	---	---	3,250

Groundwater Quality

The groundwater samples obtained from selected monitoring wells and other sources were analyzed for coarse phenols, mineral oil and grease and total petroleum hydrocarbons (TPH). The analytical results for the groundwater samples tested are summarized below.

TABLE 3
ANALYTICAL RESULTS OF GROUNDWATER TESTING

BOREHOLE NO.	DEPTH (m)	ELEVATION (m)	MINERAL OIL & GREASE (PPM)	COARSE PHENOLS (PPM)
MW-2	2.26	93.43	0.6	----
MW-4	3.66	93.70	0.2	0.019
MW-5	4.06	93.89	0.2	<0.002
MW-6	3.33	93.70	0.2	<0.002
MW-7	3.35	93.74	<0.1	<0.002
MW-8	2.08	93.87	0.2	<0.002
MW-9	2.62	93.11	0.1	<0.002
MW-10	0.46	93.77	<0.1	<0.002

LOCATION	MINERAL OIL & GREASE (PPM)	COARSE PHENOLS (PPM)
- WATER WITHIN BUILDING SUMP PIT.	<0.1	<0.007
- GROUNDWATER WITHIN EXCAVATION FOR TANKS.	0.3	0.086

BOREHOLE NO.	DEPTH (m)	ELEVATION (m)	TOTAL PETROLEUM HYDROCARBONS (PPM)
MW-4	3.66	93.70	0.03
MW-6	3.33	93.70	0.04
MW-8	2.08	93.87	0.05
MW-10	0.46	93.77	0.07
GROUNDWATER FROM BASE OF STORAGE TANK EXCAVATION			63.50

6.0 ELECTROMAGNETIC SURVEY

An electromagnetic survey was undertaken by Geoterrex Limited of Ottawa for the purpose of delineating possible contaminated areas. A grid pattern was selected to provide adequate coverage of the anticipated contaminated area. The survey fieldwork was carried out using EM34-3 apparatus. Refer to **Figure 5** for the illustrated results of the electromagnetic survey.

In summary, phenolic compounds have slightly higher conductivity values while fuel oil can be reflected by low conductivity values. The effectiveness of the program was hampered by interference from underground services and the existing power plant. Comparing the results of the chemical testing carried out as part of the environmental investigation, the observations made during excavation operations and the electromagnetic survey, low conductivity values may indicate possible fuel oil and concentrated high conductivity areas in the vicinity of the underground services, especially north of the blending tank, may indicate possible concentrations of phenolic compounds.

7.0 SUMMARY OF REMEDIATION OPERATIONS

Excavation Operations of Uncontaminated Soil

The surficial uncontaminated soil at the subject site was removed by means of excavation. The excavated soils were stockpiled on Agriculture Canada property at selected locations north of the subject site. The excavated uncontaminated soil stockpiled on site is being monitored to ensure that isolated contamination pockets, if encountered, are removed.

For the greater part, the surficial and subsurface soils, to a depth above the high groundwater table, are considered to be acceptable for reuse as landscape material or as in-fill material where frost susceptibility and structural capacity are of no concern. It was essential to excavate the relatively non-contaminated soils to a distance of at least 3.0 metres beyond the perimeter of the anticipated contaminated zone. This wider excavation was undertaken to minimize the amount of contaminated soils removed and to prevent non-contaminated materials from sloughing into the excavation and mixing with contaminated soils. Refer to **Figures 6 and 7** for sectional details of the proposed excavation.

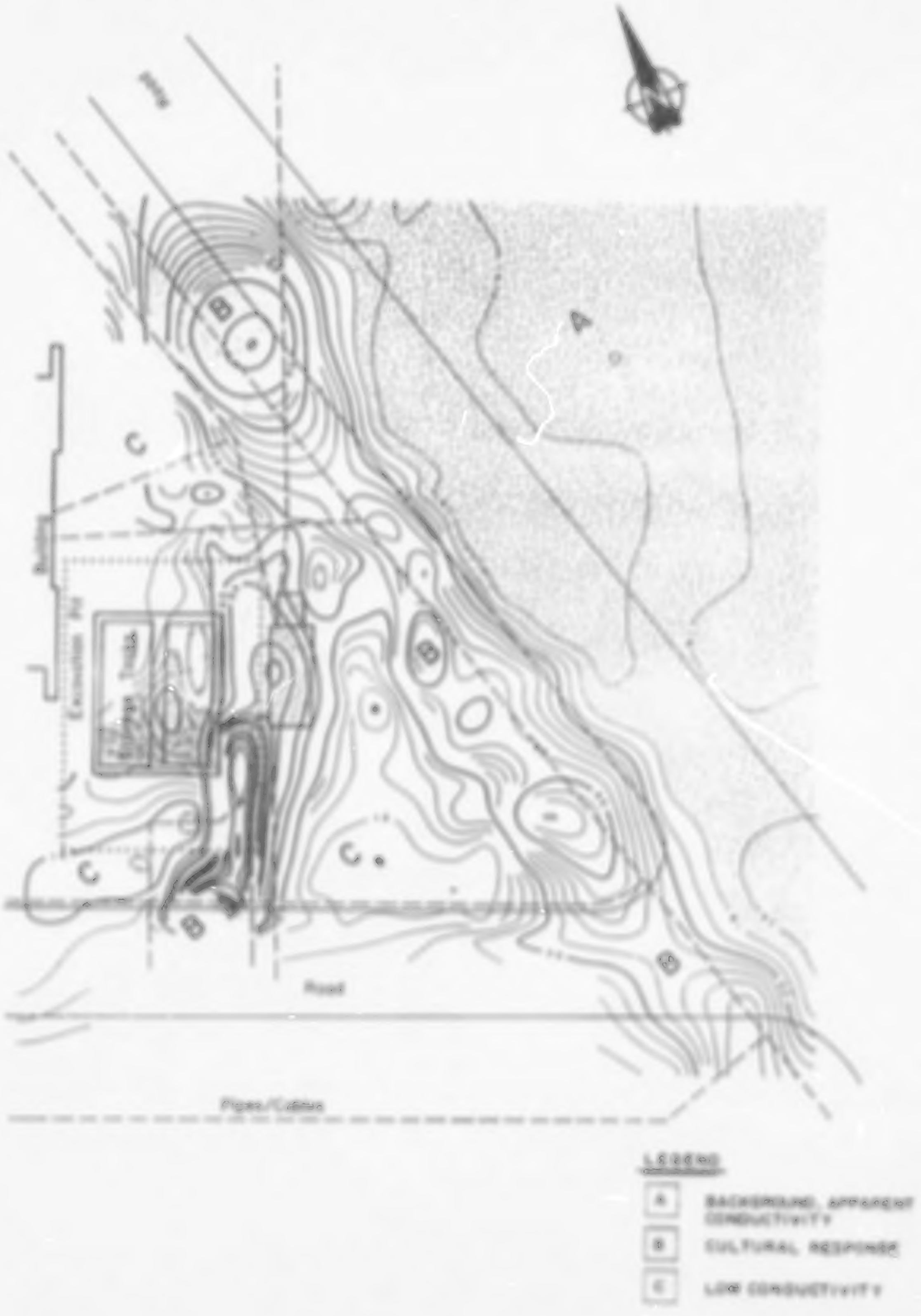

Rails
A
B
B
B
B
C
C
C
Building
Excavation Pit
Storage Tanks
Road
Pipes/Cables
LEGEND
A BACKGROUND, APPARENT CONDUCTIVITY
B CULTURAL RESPONSE
C LOW CONDUCTIVITY

FIGURE 5 - RESULTS OF ELECTROMAGNETIC SURVEY

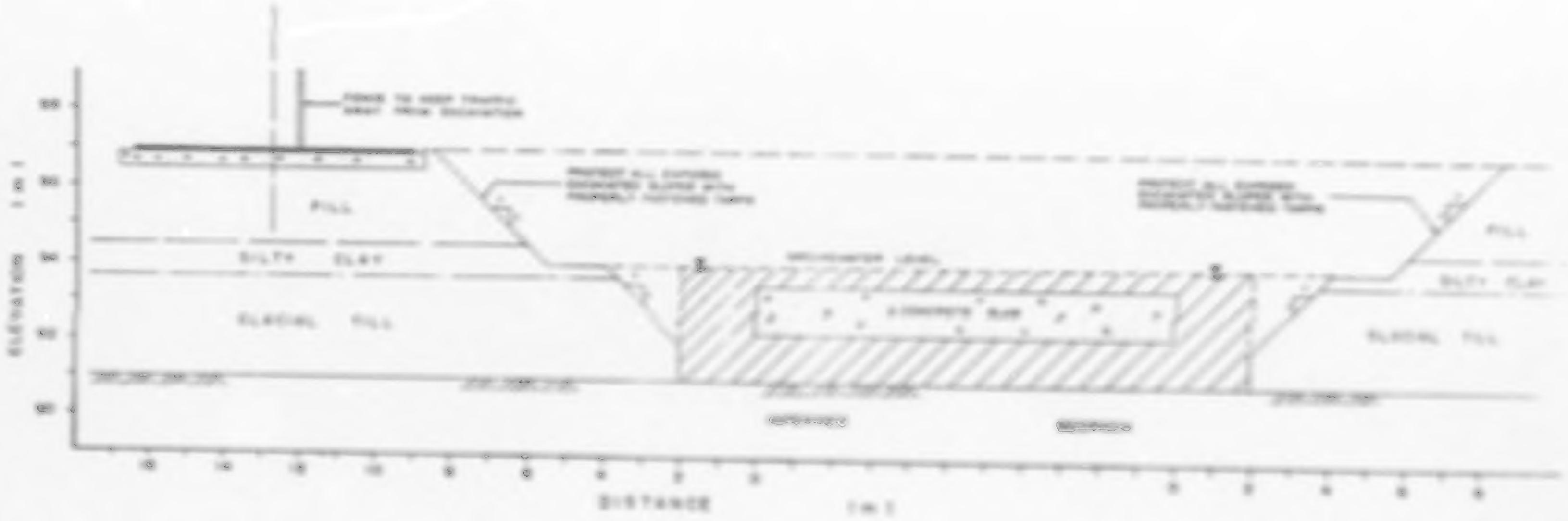

ELEVATION (m)
FENCE TO KEEP TRAFFIC AWAY FROM EXCAVATION
PROTECT ALL EXPOSED EXCAVATED SLOPES WITH PROPERLY FASTENED TARPS
FILL
SILTY CLAY
GLACIAL FILL
GROUNDWATER LEVEL
CONCRETE SLAB
PROTECT ALL EXPOSED EXCAVATED SLOPES WITH PROPERLY FASTENED TARPS
FILL
SILTY CLAY
GLACIAL FILL
DISTANCE (m)

FIGURE 6 - PROPOSED EXCAVATION CROSS - SECTION (NORTH - SOUTH)

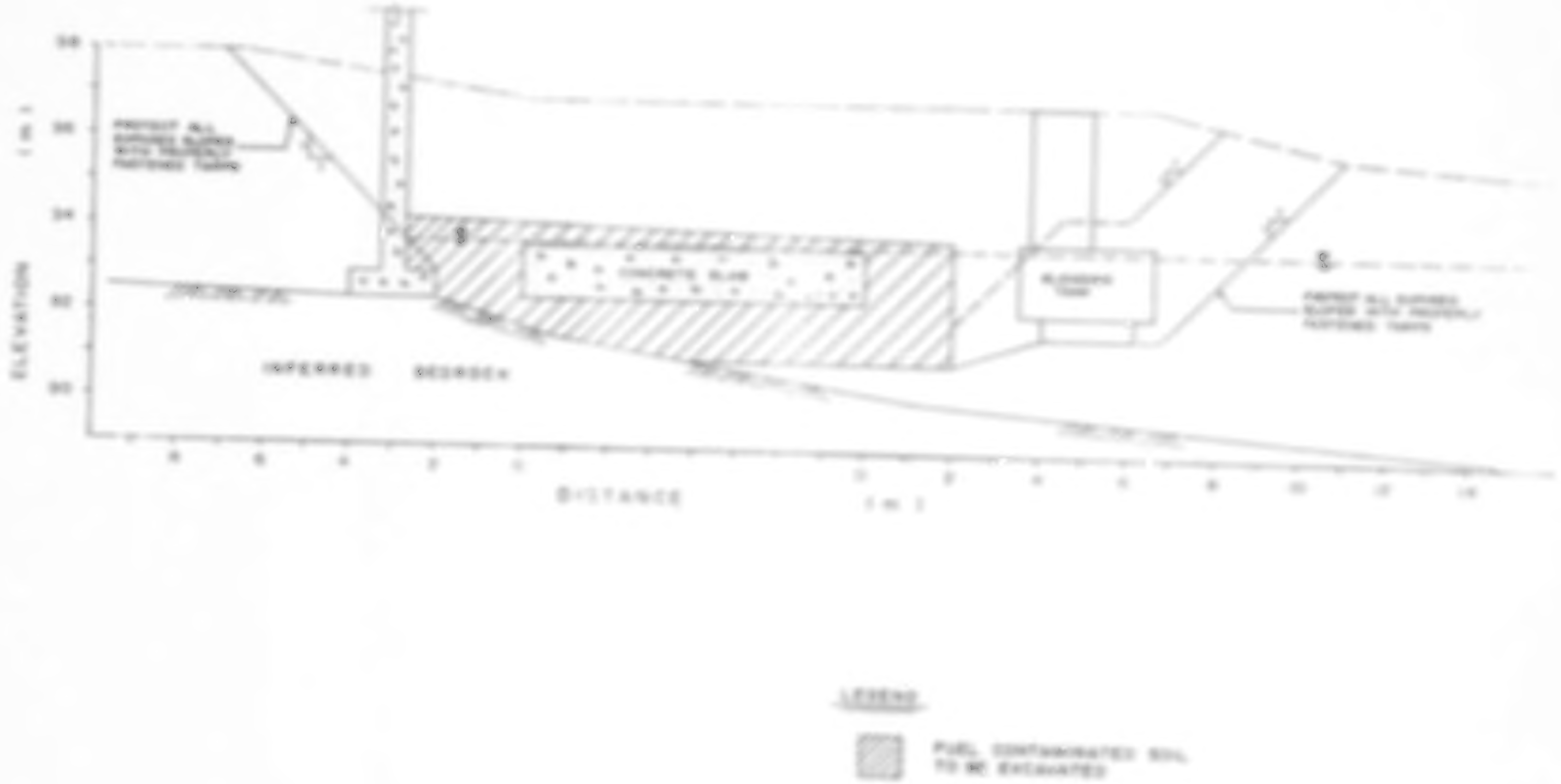

ELEVATION (m)
38
36
34
32
30
PROTECT ALL EXPOSED SLOPES WITH PROPERLY FASTENED TARPS
CONCRETE SLAB
INFERRED BEDROCK
PROTECT ALL EXPOSED SLOPES WITH PROPERLY FASTENED TARPS
8
6
4
2
0
DISTANCE (m)
0
2
4
6
8
10
12
14
LEGEND
FUEL CONTAMINATED SOIL TO BE EXCAVATED

FIGURE 7 - PROPOSED EXCAVATION CROSS - SECTION (EAST - WEST)

Contaminated Material Designated for Landfill Disposal

The results of MOE's Regulation 309 Schedule 4 Leachate Quality Criteria test carried out on saturated fuel contaminated samples were considered to be acceptable for landfill disposal. The test results were accepted by the Regional Municipality of Ottawa-Carleton (RMOC). Fills and native soils underlying the non-contaminated soils, found to have some degree of hydrocarbon contamination, are being excavated and transported to the Trail Road Regional landfill site.

Operations were undertaken to remove the existing concrete slab and saddles in order to provide access to the underlying fuel-contaminated soil. These operations were temporarily halted until groundwater within the excavation could be treated and controlled.

Exposure of the Existing Blending Tank

Excavation operations were extended to expose the existing blending tank. Precautions were taken to ensure that no damage occurred to the blending tank and associated piping. During prolonged cold weather periods, the blending tank was insulated to reduce excessive differential temperature changes.

Leaks were detected within the connection joints of the sanitary sewer inlet to the blending tank. The joints along the sanitary sewer were dissolved due to their poor resistance to excessive temperatures (between 100 and 120°C) associated with steamed biowaste effluent. Leaks were also observed within joints between the different chambers of the blending tank. It is our understanding that the blending tank system is currently under review by Public Works Canada and Agriculture Canada personnel.

Groundwater Treatment and Disposal

Operations to pump and treat the contaminated groundwater at this site are currently underway. Once a suitable filtering and treatment operation is implemented, treated groundwater will be sampled on a daily basis and tested for both coarse phenols and Total Petroleum Hydrocarbons (TPH) as required by RMOC and the City of Nepean prior to discharging into the sanitary sewer.

The following criteria, as specified by the Environmental Services Department, Water Pollution Control Division of RMOC, must be satisfied prior to disposal of treated groundwater within the sanitary sewer.

Parameter	**Criteria**
Total Petroleum Hydrocarbons	0.5 ppm
Coarse Phenols	1.0 ppm

The Department of Engineering at the City of Nepean was contacted regarding timing and rate of discharge guidelines for this project. The City of Nepean expressed no immediate concerns, stating that the sanitary sewer would not be affected by the anticipated insignificant discharge volumes.

9.0 CONCLUSIONS

Conventional monitoring well investigative procedures can be greatly complemented by incorporating an electromagnetic survey (EM). An electromagnetic survey can delineate possible contaminated areas under relatively uniform background conditions with proper interpretation from an experienced geophysicist. Monitoring wells can then be located based on the initial findings of the EM survey. A more cost effective investigation program can be implemented rather than selecting borehole locations on a more random basis.

ACKNOWLEDGEMENTS

The cooperation of Environment Canada, Public Works Canada and Agriculture Canada is gratefully acknowledged. The authors wish to express their gratitude to Mr. Robert Thompson of Agriculture Canada for convincing all parties directly and indirectly involved with this project of the necessity for innovative investigation and remediation methods.

NON-INVASIVE ENVIRONMENTAL MONITORING ELECTRO-MAGNETIC (E.M). SURVEYS

Andy Rybak, Vice President, Areco Canada Inc.

(See Newsletter Hand-out)

LEAK DETECTION FOR UNDERGROUND STORAGE TANKS

Dan Senia, Consultant, Davis Controls Ltd.

Leak Detection Methods for Underground Storage Tanks

1 - Ground - Water Monitoring

2 - Vapour Monitoring

3 - Secondary Containment with Interstitial Monitoring

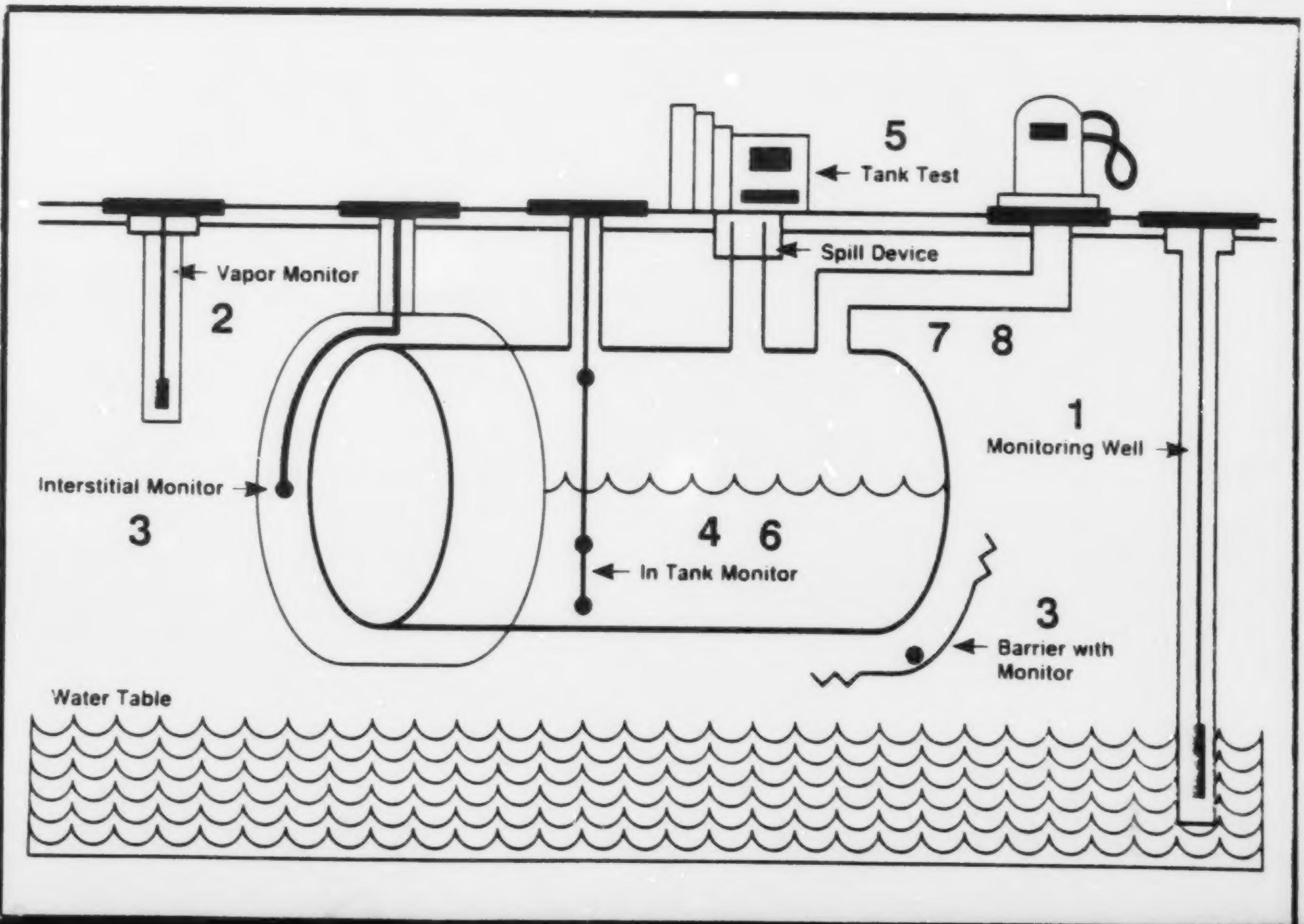
4 - Automatic Tank Gauging Systems

5 - Tank Tightness Testing and Inventory Control

6 - Manual Tank Gauging

7 - Leak Detection for Underground Suction Piping

8 - Leak Detection for Pressurized Underground Piping


5
Tank Test
Spill Device
Vapor Monitor
2
7 8
1
Monitoring Well
Interstitial Monitor
3
4 6
In Tank Monitor
3
Barrier with Monitor
Water Table

SESSION 5

ENVIRONMENTAL AUDITING

Moderator: Lawrence King, Senior Environmental Officer
Ottawa District Office, Environmental Protection
Ontario Region, Environment Canada

OVERVIEW OF ENVIRONMENTAL AUDITING

Marie-Claude Savoie, Consultant, Arthur D. Little of Canada Ltd.

(See Hand-Out)

CASE STUDY #1: ENVIRONMENTAL AUDIT OF THE RIVER ROAD ENVIRONMENTAL TECHNOLOGY CENTRE

Dave Thornton,Director, RRETC, Environment Canada

Environmental Auditing

What is an Environmental Audit

- A formal evaluation of a facility's environmental management practices
- Assesses compliance with regulated requirements and conformance with policies and best-management practices

Laboratory Environmental Audit

- Audit protocols specific to lab operations
- includes a strong safety & health focus

Laboratory Environmental Audit

Pilot Project Objectives

- To demonstrate the auditing process
- To test the draft lab protocol
- To provide feedback on environmental management practices at RRETC

Main Elements

- Waste Management
- Wastewater Management
- Emergency Response
- Air Management
- Material Handling

RRETC

Organization & Program Areas

- Pollution Measurement Division
  - NAPS Network
  - Stack Testing
- Chemistry Division
  - Inorganic & Organic Analyses
- Mobile Sources Emissions Division
  - Exhaust Compliance Testing
  - Non-regulated emissions
- Emergencies Engineering Division
  - Oil & Chemical Spill Cleanup R,D&D
- Emergencies Science Division
  - Spill Behaviour, Fate & Effects
  - Hazard-level Monitoring & Remote Sensing

General Status

- About 50 **detailed recommendations**
- **Response Plan** by RRETC
- Action is **complete on 60%** of recommendations
- **Action has been initiated on all remaining recommendations**
- The remaining recommendations require:
    - capital projects
    - longer-term project work

Specific Comments

Waste Management

- **Waste classification/registration/disposal system** fine tuned
- **PWC** provided with Audit Protocol and RRETC Response to Audit (for Realty Management)
- **Waste Management Document** to be finalized this fiscal year
- **S&H/Environmental Coordinator** to be hired in FY1991-92

Specific Comments

Wastewater Management

- Summary of **Gloucester Sewer-Use By-Law** restrictions posted by each lab sink
- PWC requested to provide **up-to-date sewer blueprints**
- PWC asked to cost and design an **inspection manhole**
- Regular **monitoring of sewer manhole** to be part of FY1991-92 Realty Management Agreement

Specific Comments

Emergency Response

- Fenced compound and explosion-proof shed no longer used for **temporary fuel storage**
- Copies of ***RRETC Emergency Response Manual*** sent to C&P Lab Managers

Specific Comments

Air Management

- Formalized **fume-hood maintenance** program to be part of new Realty Management Agreement
- **CO monitoring** system in MSED lab up graded

Specific Comments

Material Handling

- **Two old underground tanks removed**
- Scheduled **dipping program** implemented for remaining five tanks
- Formalized **maintenance and testing program** included in new Realty Management Agreement

General Comments

RRETC Management & Staff Attitude

- An **opportunity** for an **independent assessment**
- An **educational** process

CASE STUDY #2: ENVIRONMENTAL/OCCUPATIONAL HEALTH AND SAFETY AUDIT OF THE TRANSPORT CANADA AIRCRAFT SERVICES DIRECTORATE FACILITY AT OTTAWA INTERNATIONAL AIRPORT

Doug Hickey, Manager, Dangerous Goods Program
Aircraft Services Directorate, Transport Canada

TRANSPORT CANADA

AIRCRAFT SERVICES

DANGEROUS GOODS
PROGRAM

BACKGROUND

Aircraft Services Directorate operates and maintains over 100 fixed and rotary wing aircraft for the Department of Transport. These aircraft are dispersed across Canada, in 16 facilities.

Major airframe overhauls and most engine changes are done at the **Aircraft Services** facilities at Ottawa International Airport which house our flight operations,maintenance and training facilities, a spare parts depot, avionics, electrical and machine shop, and our administration, financial and inspection staff. Daily maintenance and occasional engine changes are done at regional bases at Moncton, Dorval, Mississauga, Winnipeg and Vancouver.

Transport Canada's pilots, aircraft maintenance engineers, inspectors and avionics and electronics technicians maintain their proficiency through various courses conducted by the major airlines, aircraft manufacturers and through our own training facilities.

AUDIT NEED

Federal agencies generally must comply with all provisions of Federal Environmental statues and regulations as well as all applicable Provincial and municipal requirements, with the exception of very limited exemptions which may be issued on a site-specific basis.

Since the 1970's there has been an unparalleled increase in environmental legislation and associated regulatory controls. These legislative changes, coupled with a shift in emphasis toward increased enforcement, have substantial public support. As a result, the legal framework within which the **Aircraft Services Directorate** of Transport Canada conducts its business is quite complex and is likely to become more so as new legislation and public pressure develops in response to existing and emerging environmental issues.

These changes in the regulatory setting make it crucial that management determines the extent of its legal compliance and the risks of non-compliance on a site by site basis at Aircraft Services facilities across Canada. The environmental audit is a formal, periodic examination and checking of environmental management systems to determine their worth in achieving environmental objectives.

In managing for environmental assurance, the basic management philosophy is that the full range of potential environmental risks to the Aircraft Services facility be managed, not just those covered by legislation. The regulations can sometimes be grey and be open to interpretation as they try to cover all of the possibilities. As well, the procedures to control risks may involve implementing procedures that are designed to protect against longer term environmental risks, such as programs to assure the integrity of underground storage tanks. The principal focus, then, is on building an environmental management system that identifies and anticipates hazards as well as manages consequences. Commitment to environmental excellence and corporate objectives must be at all levels from the Director General, Aircraft Services, and executives through to all operations staff if an environmental assurance program is to achieve maximum success.

Although the environmental audit is often considered separately from health and safety and chemical management, it is sometimes difficult to consider these disciplines in isolation from each other. However, there are two characteristics of the Aircraft Services Directorate that inexplicably link these two areas.

First, in our experience, it is very difficult to separate health and safety issues from environmental control in maintenance operations where so many chemicals are used. This is especially true at Aircraft Services Directorate where 1700 chemicals have been identified under WHMIS.

The second point is that Occupational Health and Safety can overlap with environmental control as it is realized that WHMIS deals with understanding the hazardous characteristics of the chemical, being able to respond correctly to emergencies, reacting to a spill and waste disposal.

PROJECT OBJECTIVE AND SCOPE

The terms of reference for the complete project where split into two phases, with Environment Canada funding phase I and Aircraft Services Directorate funding phase II.

Phase I involved -

- Developing an environmental/occupational health and safety audit plan and protocol for the Transport Canada Aircraft Services Directorate facility at Ottawa International Airport.
- Provide training for audit team member specific to the methodologies to be used in conducting the audit and completing the audit report.
- Prepare a presentation and report for the Director General, Aircraft Services, on the results of phase I and provide budget and resource estimates for phase II.

Phase I objectives where clear in that they stated that an audit team leader was required to facilitate the learning process in Aircraft Services Directorate as well as Environment Canada and Labour Canada.

Phase II involved -

- Providing an audit team leader for the audit.
- Preparing a draft and final report of the audit to the Director General, Aircraft Services.

In terms of developing and conducting an environmental and occupational health and safety audit, Aircraft Services Directorate proved to be a model site with which to begin this pilot program.

Clearly, it appears that the initiation of the environmental audit program and the associated Protocols where designed to provide management and the public with the confidence that environmental management at our facilities are being appropriately identified and handled.

The Aircraft Services Directorate facility in Edmonton, Alberta is now scheduled for the same audit in the fall of 1991.

AIRCRAFT SERVICES

DANGEROUS GOODS PROGRAM

OCCUPATIONAL HEALTH & SAFETY
ENVIRONMENTAL PROTECTION
FIRE PROTECTION
WHMIS & TDG
HAZARDOUS MATERIALS
EMERGENCY REPONSE & PLANNING

OTTAWA CANADA
AAFSA (613) 998-5988

DANGEROUS GOODS PROGRAM

THE PURPOSE:

- TO DEVELOP AN ENVIRONMENTAL HEALTH AND SAFETY AUDIT PLAN FOR AIRCRAFT SERVICES DIRECTORATE.
- TO DEVELOP AUDIT PROTOCOLS
- TO TRAIN THE DESIGNATED TEAM MEMBERS

THE GOALS OF THE AUDIT:

- VERIFY COMPLIANCE WITH FEDERAL, PROVINCIAL AND MUNICIPAL ENVIRONMENTAL, HEALTH AND SAFETY REGULATIONS EVEN IF NOT "OFFICIALLY" APPLICABLE TO A FEDERAL FACILITY.

- VERIFY COMPLIANCE WITH APPLICABLE TRANSPORT CANADA AND AIRCRAFT SERVICES DIRECTORATE INTERNAL REQUIREMENT SUCH AS POLICIES, DIRECTIVES AND STANDARDS.

- DETERMINE WHETHER ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT CONTROL SYSTEM ARE IN PLACE AND FUNCTIONING.

- DETERMINE WHETHER OPERATIONS ARE CONSISTENT WITH GOOD ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT PRACTICES (SUCH AS THOSE DESCRIBE IN CODES OF PRACTICE, GUIDELINES, EXTERNAL STANDARDS, OR AS IDENTIFIED BY THE AUDITORS WHILE ON SITE).

- IMPROVE COMMUNICATION WITHIN THE ASD ORGANIZATION.

- PROVIDE A MANUAL AND PROTOCOLS THAT CAN BE USED (WITH MODIFICATIONS) AT OTHER ASD FACILITIES.

AUDIT PROTOCOLS:

1. SAFETY AND FIRE PREVENTION PROTOCOL
2. SOLID AND HAZARDOUS WASTE MANAGEMENT PROTOCOL
3. SPILL RESPONSE PROTOCOL
4. CHEMICAL MANAGEMENT PROTOCOL
5. AIR EMISSION CONTROL PROTOCOL
6. WATER AND WASTEWATER MANAGEMENT PROTOCOL
7. INDUSTRIAL HYGIENE PROTOCOL
8. INTERNAL CONTROLS QUESTIONNAIRE

THE AUDIT TEAM:

- DOUG HICKEY, MANAGER, DANGEROUS GOODS PROGRAM,TCASD

- LAWRENCE KING, SENIOR ENVIRONMENTAL OFFICER, ENVIRONMENT CANADA

- TIM PULLEN, SAFETY OFFICER AND WHMIS INSPECTOR, LABOUR CANADA

- TED BANKS, ENVIRONMENTAL AND HAZARDOUS MATERIALS OFFICER, C.F.B. OTTAWA (S)

- MARIE-CLAUDE SAVOIE (TEAM-LEADER), CONSULTANT, ARTHUR D. LITTLE OF CANADA LIMITED

AIRCRAFT SERVICES

THE BENEFITS OF THE AUDIT:

- PROVIDED ASSURANCE TO MANAGEMENT THAT THE FACILITY IS OPERATED IN COMPLIANCE WITH FEDERAL, PROVINCIAL AND MUNICIPAL ENVIRONMENTAL, HEALTH AND SAFETY LAWS, REGULATIONS AND GUIDELINES.
- INCREASED EMPLOYEE AND MANAGEMENT AWARENESS OF ENVIRONMENTAL, HEALTH AND SAFETY ISSUES.
- IMPROVED OVERALL ENVIRONMENTAL, HEALTH AND SAFETY PERFORMANCE AT ALL ASD FACILITIES.
- ASSISTED THE ORGANIZATION IN THE MANAGEMENT OF ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS.
- REDUCED LIABILITIES AS A RESULT OF IDENTIFICATION OF DEFICIENCIES AND IMPLEMENTATION OF APPROPRIATE CORRECTIVE ACTIONS.
- INCREASED SHARING OF ENVIRONMENTAL, HEALTH AND SAFETY INFORMATION BETWEEN ENVIRONMENT CANADA, LABOUR CANADA AND TRANSPORT CANADA TO HELP PROMOTE AFFECTIVE SOLUTIONS.

DANGEROUS GOODS PROGRAM

SESSION 6

GOING GREEN IN THE FEDERAL WORKPLACE

Moderator: Lawrence King, Senior Environmental Officer
Ottawa District Office, Environmental Protection
Ontario Region, Environment Canada

ENVIRONMENT CANADA'S "GO GREEN AT WORK" PROGRAM

Ann MacKenzie, Director, Office of Environmental Stewardship
Environment Canada

GO GREEN AT WORK

INTRODUCTION

A popular question these days seems to be "What are you doing for the environment?" More specifically, a question that has certainly come up in political discussions is "What is the government doing for the environment?". Just as the Canadian public looks to the government to set an example, within the Federal family, departments and agencies have looked expectantly to Environment Canada as a model department.

Environment Canada has anticipated this by introducing the Go Green At Work program. In the same way that the Code of Environmental Stewardship and its related targets are intended to get the Federal House in Order, Go Green at Work is meant to provide a structure for minimizing the negative environmental impacts of the department's daily operations.

What I would like to do today is to give you a little bit of background on the Go Green at Work program, - how it.originated, its basic goals, where it stands at present, and where it's headed.

HISTORY

In recent years, as awareness about environmental issues has grown, concerned individuals in Environment Canada, as in many organizations, have taken the initiative to adjust their daily office practices accordingly. Many employees have succeeded in making operations in their own offices more environmentally sustainable.

Take, for example, the staff of the Canadian Parks Service. Parks regional offices boast everything from self-initiated paper recycling programs to an ingenious project at one Historic Site where elm seedlings are distributed to Park visitors who return used paper and glass for recycling.

During the summer of 1990, the Sustainable Development branch of Environment Canada established a model Green Office. The Green Office is a central area for volunteer based activities such as collecting recyclables, re-using paper and supplies, and discouraging the use of disposables.

It became obvious that there was a wealth of ideas and experience within the department and it was felt that these ideas should be collected and given wide circulation so that as many people as possible could benefit from them. Environmentally conscious employees across the country shouldn't have to feel that they were working in isolation.

GO GREEN AT WORK

The Go Green at Work program was conceived during the period when the Green Plan was being developed. It was a means of incorporating the spirit of the Green Plan into our day-to-day activities. The program was intended to support and encourage grass-roots actions and to formally recognize their value.

The program follows the Sustainable Development Branch's example of a volunteer based program, encouraging participation by all, but not demanding it. At Environment Canada, as with many departments and agencies, the character of each office is a unique as the task it performs. Something that works well for the Conservation Lab, for example, may not work for the Weather Office. As such, in the Go Green program the onus is on the employees to decide which ideas they feel will be most feasible and appropriate in improving operations within their own area.

To complement these voluntary efforts, new departmental policies and procedures will be introduced. As we all know, the process involved in instituting new guidelines can be a long one. With this in mind, straightforward solutions to common problems were seen as the best way to make an immediate difference, with the adjusted policies eventually providing support from the top. The introduction of the Go Green at Work program is also an opportunity to give employees a head-start and make the eventual implementation of new policies smoother.

THE GO GREEN GUIDE

The real goals of the program are to change attitudes and give individuals the opportunity to make a difference, a chance to make a contribution. The key to this success was to make it as easy as possible for people to change their behaviour. The publication of Go Green at Work - A Guide for Environment Canada Employees was a crucial step in doing just that. It puts hundreds of excellent ideas at their fingertips. What's more, it is essentially a collection of practical tips and suggestions FROM Environment Canada employees FOR Environment Canada employees. It is based upon the now familiar principles of reduce, re-use and recycle.

THE LAUNCH

The formal "Go Green at Work" launch for the National Capital Region was held on December 14th. Displays in the lobbies of Environment Canada's main Hull offices included a working Green Office, staffed by many of the same volunteers who had already started green offices on their floors, to demonstrate and explain its components and procedures. It was at the launch that the The Go Green at Work guide was first made available to Environment Canada employees. A special GO GREEN edition of the departmental Our Environment newsletter was published for the launch that documented some of the many Green "success stories" from both the national capital and the regions.

At the same time, packages containing all the necessary ingredients for a "Go Green" launch were sent to the regional offices. These included posters, guides, newsletters and suggestions aimed at managers to help them organize their own campaigns.

The launch in the National Capital Region was used as an opportunity to establish contact with employees who were interested in finding out more about a Green Office and, eventually, organizing "green groups" in their own areas. It was quickly obvious that many people had been waiting for that little push.

The one-day launch displays were followed closely with visits by the Deputy Minister and the Associate Deputy Minister to several Environment Canada buildings to promote the program. These included touring existing Green floors and recognizing the endeavours of outstanding Green activists in the department - those who had made efforts above and beyond the call of duty. Again, care was taken to underline the bottom-up nature of "Go green". Upper management was supporting the program, not initiating or leading it.

THE FOLLOW-UP

During the preparations for the Go Green launch, it was recognized that a one-time promotional effort would not be enough to effect long-term, fundamental changes to daily office practices. A need for considerable follow-up was anticipated.

After the successful launch of the program, therefore, responsibility for the initiative was turned over from the Communications branch to the Office of Environmental Stewardship. The Office acts as a focal point and clearinghouse for "green" ideas and information. The full-time Green Office Coordinator provides support and advice to keen greeners. Green Office groups have been organized on over half of the floors in Environment Canada's headquarter buildings as well as in several satellite offices. Under the general direction of the Green Office Coordinator, these groups have been able to raise environmental awareness and improve everyday operations on their floors.

Mechanisms have been put in place to facilitate, for example, the large-scale collection of "One-Side-Used" paper to be assembled into message pads. This process still relies on the help of volunteers to monitor the paper quality. With continued employee education about this and other issues, it is hoped that, in the near future, the time demands on volunteers will be minimized.

CONCLUSION

The Go Green program is continually evolving. We're learning as we go. Suggestions and feedback from employees have allowed us to refine our approach and expand our resource base. We hope to continue to tailor the program to the specific and changing needs of the department.

Environmental responsibility is a necessary and integral part of a sustainable future. Clearly, a long-term, sustainable green workplace requires more than just an initial effort. We are committed to ensuring that the green workplace is here to stay.

THE NATIONAL ENVIRONMENTAL CHOICE PROGRAM

Graham Hardman, Director, Environmental Choices Program
Environment Canada

ENVIRONMENTAL CHOICE

THE GOAL OF THE ENVIRONMENTAL CHOICE PROGRAM IS TO EASE THE BURDEN ON THE ENVIRONMENT. NOT THROUGH REGULATION. NOT THROUGH TAXATION. BUT THROUGH THE MARKET.

CONSUMER

Growing demand for products that ease the burden on the environment

WE BEGIN WITH THE CONSUMER AND THE GROWING CONSUMER DEMAND FOR PRODUCTS THAT EASE THE BURDEN ON THE ENVIRONMENT. WE SEEK TO HARNESS THIS SHIFT IN CONSUMER PREFERENCES, THIS GREEN PURCHASING POWER, TO PULL INDUSTRY TOWARDS THE PRODUCTION OF GOODS THAT ARE LESS HARMFUL.

INDUSTRY

Eager to supply that demand

PART TWO OF THE EQUATION, THEREFORE, IS INDUSTRY, ALWAYS EAGER TO SUPPLY CONSUMER DEMANDS INCLUDING THE DEMAND FOR ENVIRONMENTALLY SOUND PRODUCTS.

GOVERNMENT

Providing credible information on which products those are

BUT WHO SAYS WHICH PRODUCTS THOSE ARE? CONSUMERS ARE SKEPTICAL ABOUT INDUSTRY'S ENVIRONMENTAL CLAIMS. THERE IS A NEED FOR UNBIASED, CREDIBLE INFORMATION AS TO WHICH PRODUCT WOULD MAKE A GOOD ENVIRONMENTAL CHOICE.

Consumer

+

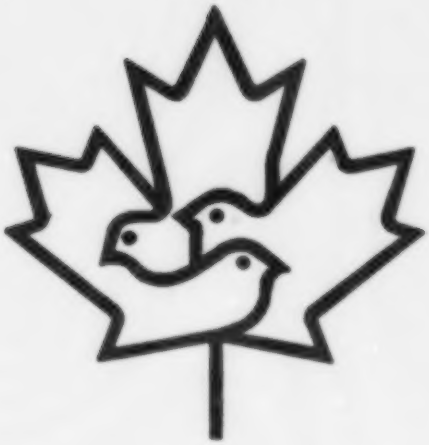
Industry

+

Government

Healthier Environment

AND THAT'S WHAT GOVERNMENT, THROUGH ENVIRONMENTAL CHOICE, WILL PROVIDE. CREDIBLE INFORMATION AS TO WHICH PRODUCTS THOSE ARE. BOTH CONSUMERS AND PRODUCERS NEED THE INFORMATION. BY PROVIDING IT WE CAN HARNESS THE PURCHASING POWER OF THE CONSUMER TO DRAW INDUSTRY TOWARDS PRODUCING GOODS THAT ARE LESS HARMFUL TO THE ENVIRONMENT, WE CAN HELP THE SUPPLY-DEMAND DYNAMIC WORK FOR A HEALTHIER ENVIRONMENT. IT'S A WAY IN WHICH CONSUMERS, INDUSTRY AND GOVERNMENT CAN WORK TOGETHER FOR A HEALTHIER ENVIRONMENT.



The EcoLogo

THE MEANS BY WHICH PRODUCTS WILL BE DISTINGUISHED AS BEING A GOOD ENVIRONMENTAL CHOICE IS THROUGH OUR SYMBOL OF ENDORSEMENT, THE ECOLOGO, THREE BIRDS INTERTWINED TO FORM THE SHAPE OF A MAPLE LEAF... SYMBOLIZING THE THREE SECTORS, CONSUMERS, INDUSTRY AND GOVERNMENT, WORKING TOGETHER.

THE ECOLOGO WILL BE LICENSED FOR USE BY BUSINESSES ON PRODUCTS AND SERVICES THAT MEET ENVIRONMENTAL CRITERIA ESTABLISHED BY THE ENVIRONMENTAL CHOICE PROGRAM.

CONSUMERS WILL BE ABLE TO RELY UPON THE INTEGRITY OF THE EASILY RECOGNIZABLE SYMBOL IN MAKING THEIR PURCHASING DECISIONS.

- ○ Reduction
- ○ Re-use
- ○ Recycling
- ○ Management of Resources
- ○ Maximization of Energy Efficiency
- ○ Minimization of Hazardous Substances
- ○ Protection of Eco-systems and Species Diversity

THROUGH THIS ENDORSEMENT PROGRAM WE HOPE TO STEER CONSUMERS TOWARDS THE CONSUMPTION OF PRODUCTS, AND SUPPLIERS TOWARDS THE SUPPLY OF PRODUCTS THAT INVOLVE THE REDUCTION, REUSE AND RECYCLING OF MATERIALS, PRODUCTS THAT ARE COMPATIBLE WITH AND SUPPORTIVE OF THE INTELLIGENT MANAGEMENT OF RESOURCES, BOTH RENEWABLE AND NON-RENEWABLE; WE WILL ENCOURAGE THE MAXIMIZATION OF ENERGY EFFICIENCY AND THE MINIMIZATION OF THE PRODUCTION OF HAZARDOUS SUBSTANCES, AND WE WILL PROMOTE PRACTICES WHICH WILL ADD UP TO PROTECTION OF OUR ECO-SYSTEMS AND OF SPECIES DIVERSITY.

PROGRAM COMPONENTS

- ○ Minister of Environment
- ○ Independent Board
- ○ Environment Canada
- ○ Board Secretariat
- ○ Technical Agency

CREDIBILITY

- Guidelines
- Board
- Life-cycle
- C.S.A.
- Public Review
- Upgradable

IF INDUSTRY IS TO BENEFIT FROM THIS ENDORSEMENT PROGRAM, IF THE SHIFT IN CONSUMER PREFERENCE TOWARDS ENVIRONMENTALLY LESS HARMFUL PRODUCTS IS TO BE HARNESSED SUCH THAT IT PROVIDES MOTIVATION FOR INDUSTRY TO PROVIDE THOSE PRODUCTS, THEN IT IS VITAL THAT THE ENDORSEMENT HAVE MEANING FOR CONSUMERS, THAT IT BE RELIED UPON AS HAVING INTEGRITY, THAT IT BE CREDIBLE. WHAT MAKES THE ECOLOGO CREDIBLE IS THAT IT IS BACKED UP BY RIGOROUSLY DEVELOPED GUIDELINES, A DIFFERENT GUIDELINE FOR EACH CATEGORY OF PRODUCTS, THAT SET THE STANDARDS THAT MUST BE MET FOR THE ENDORSEMENT OF PRODUCTS WITHIN EACH CATEGORY.

THESE GUIDELINES ARE DEVELOPED BY AN INDEPENDENT BOARD CONSISTING OF EXPERTS IN FIELDS INCLUDING ENVIRONMENTAL ASSESSMENT, RETAILING, ENVIRONMENTAL LAW, ECONOMICS, SCIENTIFIC RESEARCH, HEALTH, MANUFACTURING.

IN SETTING STANDARDS, THE BOARD'S BOTTOM LINE IS THAT A PRODUCT MUST DELIVER A NET ENVIRONMENTAL BENEFIT WHEN ITS ENTIRE LIFE CYCLE IS TAKEN INTO ACCOUNT, WHICH REQUIRES AN UNDERSTANDING OF THE IMPACTS EACH PRODUCT CAN HAVE ON THE ENVIRONMENT FROM ITS MANUFACTURE THROUGH ITS USE AND DISPOSAL.

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THE CANADIAN STANDARDS ASSOCIATION, IS AN INDEPENDENT ORGANIZATION WELL-EXPERIENCED WITH THE SETTING OF STANDARDS AND THE TESTING OF PRODUCTS, HAS BEEN CONTRACTED TO LEND ITS EXPERTISE TO THE DEVELOPMENT OF GUIDELINES, THE ASSESSMENT OF PRODUCTS AGAINST THE CRITERIA SET OUT IN THE GUIDELINES, AND THE LICENSING OF PRODUCTS THAT MEASURE UP.

AS A FINAL CHECK ON THE BOARD'S WORK, A 60-DAY PERIOD OF PUBLIC REVIEW IS BUILT INTO THE DEVELOPMENT OF EVERY GUIDELINE. THIS IS THE BOARD'S OPPORTUNITY TO HEAR FROM ENVIRONMENTALISTS, INDUSTRIALISTS, CONSUMERS AND ANYONE FROM THE GENERAL PUBLIC WITH IDEAS ON HOW TO IMPROVE THE SUBSTANCE OF ANY GUIDELINE. OF COURSE, EVERY GUIDELINE CAN ONLY BE BASED ON THE BEST INFORMATION AVAILABLE AT THE TIME OF ITS DEVELOPMENT. AS NEW INFORMATION BECOMES AVAILABLE, GUIDELINES WILL BE MODIFIED ACCORDINGLY. AS TECHNOLOGY EVOLVES TO ALLOW THE SETTING OF HIGHER STANDARDS, THE GUIDELINES WILL BE UPGRADED.

GOALS

1. Significant benefits for the environment
2. Achievable by industry

THE IMMEDIATE GOAL IS TO SET STANDARDS THAT PRODUCE SIGNIFICANT BENEFITS FOR THE ENVIRONMENT. BUT THEY MUST BE STANDARDS THAT ARE ACHIEVABLE BY INDUSTRY. STANDARDS BEYOND THE CAPACITY OF INDUSTRY OBVIOUSLY WOULD NOT RESULT IN THE PROVISION OF LESS-HARMFUL PRODUCTS TO CONSUMERS AND WOULD NOT LEAD TO A DECREASE IN THE BURDEN ON THE ENVIRONMENT.

EXAMPLE:

RE-REFINED MOTOR OIL

LET'S LOOK AT RE-REFINED MOTOR OIL, THE FIRST PRODUCT CATEGORY DEVELOPED BY ENVIRONMENTAL CHOICE AND SEE HOW IT MOVED THROUGH THE PROCESS.

PROCESS

- ○ Category Suggestion
- ○ Board Briefing
- ○ Draft Guideline
- ○ Public Review
- ○ Final Guideline
- ○ Testing/Endorsement

- THE DEVELOPMENT OF GUIDELINES BEGINS WITH THE RECEIPT BY THE BOARD OF A SUGGESTION -- IT CAN COME FROM ANYONE IN THE GENERAL PUBLIC -- IN THIS CASE IT WAS FROM INDUSTRY THAT THE SUGGESTION CAME THAT WE DEVELOP A GUIDELINE PERTAINING TO RE-REFINED MOTOR OIL.
- A BRIEFING NOTE WAS DEVELOPED FOR THE BOARD PROVIDING AN OVERVIEW OF THE MOTOR OIL INDUSTRY, THE IMPACTS MOTOR OIL HAS ON THE ENVIRONMENT AND THE OPPORTUNITIES THAT EXIST TO REDUCE THOSE IMPACTS THROUGH RECYCLING.
- THE BOARD REQUESTED THE CSA TO DEVELOP A DRAFT GUIDELINE CONTAINING MORE DETAIL ON THE RECYCLING PROCESS INCLUDING RESULTANT VISCOSITY SPECIFICATION.

continued

(cont'd)

- AT ITS NEXT MEETING, THE BOARD DISCUSSED THE DRAFT GUIDELINE AND AGREED THAT IT SHOULD STIPULATE THAT, IN ORDER TO RECEIVE THE ENVIRONMENTAL CHOICE ENDORSEMENT, PRODUCTS WITHIN THE CATEGORY MUST CONTAIN AT LEAST 50% RE-REFINED MOTOR OIL AND HAVE A TOTAL METALLIC CONTENT OF NO MORE THAN 20 PARTS PER MILLION.

- THE DRAFT GUIDELINE WAS RELEASED FOR A 60-DAY PERIOD OF PUBLIC REVIEW.

- COMMENTS RECEIVED FROM THE PUBLIC REVIEW WERE CONSIDERED BY THE BOARD AND SMALL CHANGES WERE MADE TO THE GUIDELINE. IN JULY 1989 THE BOARD SUBMITTED THE FINAL GUIDELINE TO THE MINISTER OF ENVIRONMENT FOR HIS APPROVAL.

- AN APPLICATION FROM A MANUFACTURER FOR THE ECOLOGO WAS RECEIVED BY THE CSA THIS FALL. THEY ASSESSED THE PRODUCT AGAINST THE CRITERIA IN THE GUIDELINE AND ARE ABOUT TO ANNOUNCE THE GRANTING OF THE FIRST ENVIRONMENTAL CHOICE ENDORSEMENT.

BENEFITS

- Reduce burden on environment
- Increase consumer and business awareness
- Reward R&D innovation
- Foster development of environmental market

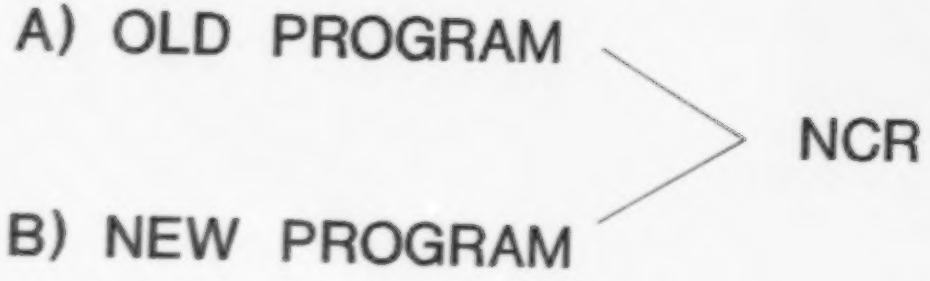
BENEFITS

- REDUCED BURDEN ON ENVIRONMENT
- INCREASE CONSUMER AND BUSINESS AWARENESS
- REWARD R & D INNOVATION
- FOSTER DEVELOPMENT OF ENVIRONMENTAL MARKET
- ABOVE ALL, THE ENVIRONMENT WILL BENEFIT IN AN ECONOMICALLY EFFICIENT WAY.
- CONSUMES AND BUSINESS WILL BECOME MORE AWARE OF THE INTERACTION OF THEIR "PRIVATE" ECONOMIC DECISIONS WITH THE ENVIRONMENT.
- PRODUCTS AND SERVICES THAT REPRESENT A REDUCED ENVIRONMENTAL RISK WILL BE FOSTERED; ENVIRONMENTAL INDUSTRY WILL BE ENCOURAGED.
- CANADIAN ENVIRONMENTAL LEADERSHIP ALSO IMPORTANT REGARDING EXPORT MARKETS; CANADIAN WORLD ROLE.

THE PAPERSAVE PROGRAM
CURRENT STATUS AND FUTURE DIRECTIONS OUTSIDE NCR

Gilles Landry, Manager, Special Projects
Crown Assets Distribution Group, Supply and Services Canada

AGENDA



A) OLD PROGRAM

B) NEW PROGRAM

NCR

C) FUTURE DIRECTION OUTSIDE NCR

A) OLD PROGRAM

1) IMPLEMENTATION

- BEGAN IN 1976
- PROMOTED BY: ENVIRONMENT CANADA
- OPERATED BY: PUBLIC WORKS CANADA
- DISPOSED BY: SUPPLY AND SERVICES CANADA
- SUPPORTED BY: MOST DEPARTMENTS AND CROWN CORPORATIONS (127 BUILDINGS)

2) METHODOLOGY

- DESK-TOP HOLDERS
- WHITE BINS IN CENTRAL LOCATIONS
- CLEANERS EMPTY WHITE BINS
- CASCADES REMOVES FROM BUILDINGS
- NET REVENUES TO CRF

3) PROBLEMS

- DECREASE IN VOLUME
- DECREASE IN QUALITY
- DECREASE IN REVENUES

NOTE

i) FINE PAPER RECYCLING PROGRAM

- ALL WHITE AND COLOURED OFFICE PAPER
- COMPUTER, PHOTOCOPIER, STAPLED PAPER
- TELEPHONE BOOKS

ii) EXCLUSION

- ENVELOPES, FILE FOLDERS
- CARBON, PLASTIC CUPS
- GLOSSY, GLUED PAPER
- METAL PARTS, FAX MACHINE

B) ENHANCED PAPERSAVE PROGRAM
(BLUE BASKET)

1) STUDY

- IN 1988, PAPERSAVE STEERING COMMITTEE (SSC, ENV, PWC) RECOMMENDED THAT A CONSULTING FIRM (ENERGY PATHWAYS INC.) BE HIRED TO:

  - CARRY RESEARCH
  - PROMOTE
  - INFRASTRUCTURE DEVELOPMENT

OF THE (OLD) PAPERSAVE PROGRAM

2) RECOMMENDATIONS

- BLUE BASKETS FOR EACH EMPLOYEE/ WORKSTATION
- WEEKLY AT-DESK COLLECTION
- PAPER GRADE REDUCTION (FROM 11 TO 5)
- COMMUNICATION (BULLETINS, POSTERS, MEMOS, HOT LINE LETTERS, STICKERS, LOGO, ETC.)

3) BENEFITS

- REDUCTION OF CONTAMINATION
- INCREASE IN QUALITY
- INCREASE IN QUANTITY
- INCREASE IN REVENUES

SKIP-A-DAY

- 4 DAY COLLECTION OF GARBAGE
- 1 DAY COLLECTION OF BLUE BOXES
- TUESDAY TO THURSDAY
- AT NO EXTRA COST
- APPROVED BY LAB, TBS, PWC, AND SSC

5) IMPLEMENTATION

A) NCR

i) METHODOLOGY

- BLUE BASKETS AT 78,000 WORKSTATIONS
- 2 YEAR IMPLEMENTATION (3,500 BASKETS PER MONTH)
- PICK-UP • SKIP-A-DAY
- NEW PAPER GRADES (6)
- BLUE BINS + BIGGER BLUE BASKETS IN HIGH GENERATION AREAS (WORD PROCESSING, PHOTOCOPIER, PRINTING & COMPUTER ROOMS, ETC.)
- CASCADES REMOVES FROM BUILDING
- NET PROCEEDS TO DEPARTMENTS APRIL 1991

ii) STATUS

- TO DATE:
  - BLUE BASKETS:
  - SITES/BUILDINGS:

iii) STATISTICS

	MET-TON	GROSS REV	AVE $/T
FY 86/87	8,932	621,157	69.5
FY 87/88	9,502	622,605	65.5
FY 88/89	10,001	855,417	85.5
FY 89/90	11,186	922,826	82.4
FY 90/91	13,214	764,000	57.6

THE PARLIAMENT HILL ENVIRONMENTAL AUDIT AND ACTION PLAN

Angela Ebsworth, Environmental Co-ordinator, House of Commons

(See "Greening the Hill" booklet)

REDUCE, REUSE, RECYCLE
WASTE REDUCTION OPPORTUNITIES AT FEDERAL FACILITIES

Bill Armstrong, President, Energy Pathways Inc.

(See Hand-out)